



R E P O R T

O F

HIS MAJESTY'S COMMISSIONERS

F O R T H E

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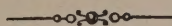
REPORT
OF
HIS MAJESTY'S COMMISSIONERS
FOR THE
INTERNATIONAL EXHIBITION,
SAINT LOUIS, 1904.

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PART I.

ROYAL COMMISSION APPOINTING COMMISSIONERS FOR THE ST. LOUIS INTERNATIONAL EXHIBITION OF 1904.

Whitehall, April 23rd, 1903.

The KING has been pleased to issue a Commission under His Majesty's Royal Sign Manual to the following effect:—

EDWARD, R. and I.

EDWARD THE SEVENTH, by the Grace of God, of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas King, Defender of the Faith, Emperor of India, to—

Our Most Dear Son and Councillor His Royal Highness George Frederick Ernest Albert, Prince of Wales, Knight of our Most Noble Order of the Garter, Knight of our Most Ancient and Most Noble Order of the Thistle, Knight of our Most Illustrious Order of Saint Patrick, Knight Grand Cross of our Most Distinguished Order of Saint Michael and Saint George, Knight Grand Cross of the Royal Victorian Order, Companion of the Imperial Service Order, Rear-Admiral in Our Fleet; President;
Our right trusty and well-beloved Cousin and Councillor Arthur Wellesley, Viscount Peel; Chairman;
Our right trusty and right well-beloved Cousin and Councillor Victor Albert George, Earl of Jersey, Knight Grand Cross of Our Most Honourable Order of the Bath, Knight Grand Cross of our Most Distinguished Order of Saint Michael and Saint George;
Our right trusty and right well-beloved Cousin Richard George Penn, Earl Howe;*

* Now The Earl Howe, G.C.V.O.

Our right trusty and well-beloved Bernard Edward Barnaby,
Baron Castletown, Companion of Our Most Distinguished
Order of Saint Michael and Saint George ;

Our right trusty and well-beloved George Arbuthnot, Baron
Inverclyde ; †

Our right trusty and well-beloved Councillor Richard
Everard, Baron Alverstone, Knight Grand Cross of our
Most Distinguished Order of Saint Michael and Saint
George, Lord Chief Justice of England ;

Our right trusty and well-beloved Councillor John, Baron
Avebury ;

Our right trusty and well-beloved Councillor Horace Curzon
Plunkett, Vice-President of the Department of Agriculture
and Technical Instruction for Ireland ; || and

Our trusty and well-beloved :—

Charles Napier Lawrence, Esquire (commonly called the
Honourable Charles Napier Lawrence) ;

Sir Charles William Fremantle, Knight Commander of Our
Most Honourable Order of the Bath (commonly called the
Honourable Sir Charles William Fremantle) ;

Sir George Hayter Chubb, Baronet ;

Sir Edward John Poynter, Baronet, President of the Royal
Academy ;

Sir Charles Rivers Wilson, Knight Grand Cross of Our
Most Distinguished Order of Saint Michael and Saint
George, Companion of Our Most Honourable Order of the
Bath ;

Sir Edward Maunde Thompson, Knight Commander of Our
Most Honourable Order of the Bath ; Director and
Principal Librarian of the British Museum ; ‡

Sir William Henry Preece, Knight Commander of Our
Most Honourable Order of the Bath ;

Sir William Turner Thiselton-Dyer, Knight Commander of
Our Most Distinguished Order of Saint Michael and
Saint George, Companion of Our Most Eminent Order of
the Indian Empire ;

Sir Herbert Jekyll, Knight Commander of Our Most
Distinguished Order of Saint Michael and Saint George ;

† Deceased.

|| Now Sir Horace C. Plunkett, K.C.V.O., F.R.S.

‡ Now Sir E. Maunde Thompson, K.C.B., I.S.O.

Colonel on the Retired List of Our Army, one of the Assistant Secretaries to the Board of Trade ;
 Sir Lawrence Alma-Tadema, Knight, Royal Academician ;
 Sir Caspar Purdon Clarke, Knight, Companion of Our Most Eminent Order of the Indian Empire ; Director of the Victoria and Albert Museum (Art Museum), South Kensington ; *
 Sir George Thomas Livesey, Knight ;
 Henry Hardinge Samuel Cunynghame, Esquire, Companion of Our Most Honourable Order of the Bath ; one of the Assistant Under Secretaries of State to Our Principal Secretary of State for the Home Department ;
 Edwin Austin Abbey, Esquire, Royal Academician ;
 Charles Vernon Boys, Esquire, Fellow of the Royal Society ;
 Thomas Brock, Esquire, Royal Academician ;
 George Donaldson, Esquire ; ||
 Clement Le Neve Foster, Esquire, Doctor of Science, Fellow of the Royal Society, Professor of Mining at the Royal School of Mines, London ; †
 John Clarke Hawkshaw, Esquire, Master of Arts, President of the Institution of Civil Engineers ;
 Thomas Graham Jackson, Esquire, Royal Academician ;
 William Henry Maw, Esquire, President of the Institution of Mechanical Engineers.
 Francis Grant Ogilvie, Esquire, Director of the Edinburgh Museum of Science and Art ; ‡
 William Quiller Orchardson, Esquire, Royal Academician ;
 Boverton Redwood, Esquire, Fellow of the Royal Society of Edinburgh ; §
 Alfred Gordon Salamon, Esquire ;
 Joseph Wilson Swan, Esquire, Master of Arts, Fellow of the Royal Society ; ¶
 Jethro Justinian Harris Teall, Esquire, Master of Arts, Fellow of the Royal Society ; and
 Francis William Webb, Esquire. Greeting !

* Now Sir Caspar Purdon Clarke, C.V.O., C.I.E.

|| Now Sir George Donaldson.

† Deceased.

‡ Now Principal Assistant Secretary to the Board of Education.

§ Now Sir Boverton Redwood, F.R.S.E.

¶ Now Sir Joseph Wilson Swan, M.A., F.R.S.

Whereas it has been notified to Us, through Our Secretary of State for Foreign Affairs, that the late President of the United States of America, pursuant to an Act of Congress, made Proclamation that an International Exhibition of Arts, Industries, Manufactures, and the Products of the Soil, Mine, Forest and Sea, would be holden in the city of St. Louis, in the State of Missouri, during the present year, which Exhibition, it has now been decided, will be opened during the year one thousand nine hundred and four.

And whereas it is Our wish that Our United Kingdom of Great Britain and Ireland and our Dominions beyond the Seas shall be represented at the said Exhibition, and that Our subjects shall take part therein.

Now, know ye that We, considering the premises and earnestly desiring to promote the success of the said Exhibition, and reposing great trust and confidence in your fidelity, discretion, and integrity, have authorised and appointed, and by these presents do authorise and appoint you, Our said Most Dear Son George Frederick Ernest Albert, Prince of Wales, together with you, Arthur Wellesley, Viscount Peel; Victor Albert George, Earl of Jersey; Richard George Penn, Earl Howe; Bernard Edward Barnaby, Baron Castletown; George Arbuthnot, Baron Inverclyde; Richard Everard, Baron Alverstone; John, Baron Avebury; Horace Curzon Plunkett; Charles Napier Lawrence; Sir Charles William Fremantle; Sir George Hayter Chubb; Sir Edward John Poynter; Sir Charles Rivers Wilson; Sir Edward Maunde Thompson; Sir William Henry Preece; Sir William Turner Thiselton-Dyer; Sir Herbert Jekyll; Sir Lawrence Alma-Tadema; Sir Caspar Purdon Clarke; Sir George Thomas Livesey; Henry Hardinge Samuel Cunynghame; Edwin Austin Abbey; Charles Vernon Boys; Thomas Brock; George Donaldson; Clement Le Neve Foster; John Clarke Hawkshaw; Thomas Graham Jackson; William Henry Maw; Francis Grant Ogilvie; William Quiller Orchardson; Boverton Redwood; Alfred Gordon Salamon; Joseph Wilson Swan; Jethro Justinian Harris Teall; and Francis William Webb, to be Our Commissioners to obtain and distribute full information as to the best mode by which Our said United Kingdom and Our Dominions beyond the Seas may be duly represented; to assist with your advice and co-operation; and generally to promote the success of the said Exhibition.

And Our will and pleasure is that you, or any three or more of you, when and so often as need or occasion shall require, so long as this Our Commission shall continue in force, do report to Us in writing under your hands and seals respectively, all and every the several proceedings of yourselves had by virtue of these Presents.

And We do by these Presents ordain that this Our Commission shall continue in full force and virtue until the various proceedings in connection with the said Exhibition shall have been properly concluded and brought to an end; and that you, Our said Commissioners, or any three or more of you, shall and may from time to time, and at any place or places, proceed in the execution thereof, and of every matter and thing therein contained, although the same be not continued from time to time by adjournment.

And for the purpose of aiding you in such matters We hereby appoint Our trusty and well-beloved Charles Moore Watson, Esquire, Companion of Our Most Honourable Order of the Bath, Companion of Our Most Distinguished Order of Saint Michael and Saint George, Colonel on the Retired List of Our Army, to be Secretary to this Our Commission.*

Given at Our Court at *Saint James's*, the twenty-third day of *April*, one thousand nine hundred and three, in the third year of Our Reign.

By His Majesty's Command,

A. Akers-Douglas.

Whitehall, 6th June, 1903.

The KING has been pleased, by Warrant under His Majesty's Royal Sign Manual, bearing date the 6th June, 1903, to appoint Sir John Benjamin Stone, M.P., to be an additional Commissioner for the St. Louis Exhibition, 1904.

* Now Colonel Sir C. M. Watson, R.E., K.C.M.G., C.B.

R E P O R T
OF
HIS MAJESTY'S COMMISSIONERS
FOR THE
ST. LOUIS INTERNATIONAL EXHIBITION OF 1904.

TO THE KING'S MOST EXCELLENT MAJESTY.

MAY IT PLEASE YOUR MAJESTY,

Your Majesty having been Most Graciously pleased by a Royal Commission dated the 23rd April, 1903, to appoint us to act as Commissioners to advise Your Majesty concerning the best method of obtaining a fitting representation of the products of the Industry and Art of Your Majesty's Dominions at the St. Louis International Exhibition of 1904, we have now the honour to lay our Report before Your Majesty.

The International Exhibition at St. Louis, entitled "The Louisiana Purchase Exposition," was held to commemorate the centenary of the purchase of Louisiana Territory by the United States of North America from the French Nation in the year 1803. An Act of Congress was passed on the 3rd of March, 1901, authorising the holding of the Exhibition and instructing the President of the United States to invite

Foreign Nations to take part in the Exhibition and to appoint representatives thereto. It was originally intended to hold the Exhibition in 1903, the Centennial Year of the Louisiana Purchase, but, as the time for preparation was considered too short, the realisation of the project was postponed to 1904.

The official invitation, asking that Great Britain might take part in the Exhibition, was forwarded by the American Ambassador in London to Your Majesty's Secretary of State for Foreign Affairs in September, 1901. The invitation was carefully considered and correspondence passed between the Foreign Office, the Treasury, the Board of Trade, the Colonial Office and India as to the desirability of taking part in the Exhibition. After due deliberation Your Majesty's Government decided to accept the invitation, and the American Ambassador was so informed early in 1903.

The Treasury was approached on the subject of the provision of funds, and a sum of £30,000 was included in the estimates for 1903-4 to be presented to Parliament. After the appointment of the Royal Commission, this sum was raised to £150,000, of which £80,000 was voted by Parliament for 1903-4 and £70,000 for 1904-5. The balance remaining to the credit of the Royal Commission on the 1st August, 1905, was £29,256 8s. 1d.; but there are expenses still to be met in respect of such services as transport of exhibits home, the publication of the Report, and the duties incidental to winding-up the business of the Commission. As, however, it will be some months before the accounts can be finally closed, we have thought it better not to defer the presentation of our Report to Your Majesty.

The Secretary of State for Foreign Affairs appointed a Committee, of which Viscount Peel was Chairman, to make the arrangements for British representation at the Exhibition. Colonel C. M. Watson, R.E., C.B., C.M.G., was selected to act as Secretary of the Committee, and was appointed for three years from February 6th, 1903. Furnished office accommodation was provided by Your Majesty's Office of Works at 47, Victoria Street, S.W., the rent being paid out of the funds provided by Parliament for the expenses connected with the Exhibition.

Shortly after the Committee had commenced its work, Your Majesty was pleased to constitute a Royal Commission and to appoint His Royal Highness the Prince of Wales as President. Viscount Peel was appointed Chairman, while Colonel Watson was named as Secretary of the Royal Commission, and subsequently as Commissioner-General, in order to place him on an equality with the Representatives of other Foreign Countries.

A meeting of the Royal Commission was held at Marlborough House on the 28th April, 1903, under the Presidency of His Royal Highness the Prince of Wales, who delivered an address, a copy of which is annexed to this Report. An Executive Committee was appointed to supervise the work generally, and a Finance Committee to take charge of expenditure, of both of which Viscount Peel was nominated Chairman. Other Committees were appointed to take charge of the organisation of the Exhibits in the different Departments, and rules for their guidance were approved so as to ensure uniformity of action.

Each Committee consisted partly of members of the Royal Commission, and partly of other gentlemen who,

from their technical knowledge and experience, were able to render important services in arranging for the British Exhibits in each Department. A list of the members of each Committee and a copy of the rules approved by the Royal Commission for their guidance are attached.

The important work of engaging the staff had been taken in hand by the Committee (which, as already mentioned, had been nominated by the Foreign Office before Your Majesty had decided to appoint a Royal Commission), and was continued by the Executive Committee, the salaries being approved by the Finance Committee. Several members of the staff had been employed in connection with previous International Exhibitions, and their knowledge of the details of such undertakings proved of great assistance. Authority was given to the Secretary to engage such subordinate staff as was required during the progress of the work, subject to the approval of the Finance Committee. A complete list of the staff is annexed.

In order to ascertain the names of firms and individuals who would be willing to take part in the Exhibition about 8,500 letters were issued to those who had taken part in previous International Exhibitions, and to other leading firms of the country. The responses were comparatively few, and it soon became evident that without financial assistance from the Royal Commission it would be impossible to obtain a good British representation. It was accordingly decided to act upon the idea formulated by His Royal Highness the Prince of Wales in his Speech at the first meeting of the Royal Commission, and to organise Collective Exhibits in several Departments, the objects being lent by manufacturers, publishers, agents, and other persons,

while the Royal Commission bore the expenses of transportation, installation, etc. This method proved extremely satisfactory.

It was further decided that Exhibitors who preferred to exhibit individually should bear their own expenses of installation and transport.

In May, 1903, Colonel Watson proceeded to St. Louis to make the preliminary arrangements, to secure space in the different Buildings, and also to obtain a suitable site for the erection of the British Royal Pavilion. At that time the construction of most of the Exhibition Buildings was so well advanced that it was possible to fix the allotments with considerable accuracy. Before leaving St. Louis on his return to London, Colonel Watson appointed Mr. L. Serrailier to act as Resident Representative during his absence. The Exhibition Authorities kindly provided an office for the work of the Royal Commission in their Administration Building, and allowed the use of it free of charge until the offices in the Royal Pavilion were completed and ready for occupation.

There are two systems of arranging Exhibits, one or other of which has been adopted at different International Exhibitions: the one being to allot a space to each Nation in which to show all its products; the other, to group in classes similar products from all Nations. The latter system has great advantages and was adopted at the Paris International Exhibition in 1900. The same system was followed at the Louisiana Purchase Exposition. The exhibits were classified under fifteen Departments, to each of which one or more of the Exhibition Buildings were assigned. In these several Buildings spaces were allotted to each country exhibiting in the Departments, so that similar

products from different countries were grouped in proximity to each other.

The spaces allotted to Great Britain and Ireland in the several Buildings and in the grounds of the Exhibition are shown on the plan annexed to this Report. The areas of the allotments were as follows :

	Square feet.
The British Royal Pavilion and Garden	120,000
Queen Victoria's Jubilee Presents .	6,750
Departments of Education and Social Economy	7,310
Department of Art	20,870
Department of Liberal Arts . . .	37,850
Department of Manufactures . . .	58,000
Department of Electricity	5,960
Department of Transportation . .	41,500
Departments of Agriculture and Horticulture	20,900
Departments of Forestry, Fish and Game	3,900
Department of Mines and Metal- lurgy	11,700
	<hr/>
	<u>334,740</u>

The British Colonies which were represented in the spaces allotted to the Royal Commission were Jamaica, the Gold Coast, and Rhodesia, besides several Departments of the Government of India.

Canada, Ceylon, New Zealand, India and Egypt had separate Commissions, and space was allotted to them independently. Canada, Ceylon and India had each a Pavilion of its own ; and in the case of the two latter

a large proportion of the exhibits were shown in the Pavilions, which were also used as tea-houses, which were much frequented by visitors.

The site allotted for the British Royal Pavilion proved in every way suitable. It was near one of the main entrances to the Exhibition, on a principal roadway, and also on the avenue leading to the Administration Building. The main body of the Pavilion was a reproduction of the Orangery of the Royal Palace of Kensington, which was erected by Sir Christopher Wren for Queen Anne in the year 1704. The main front of the Pavilion was formed by the Orangery, to which the Architects, Messrs. George and Yates, added two wings containing the offices of the Royal Commission on the one side, and reception rooms on the other. The reception rooms were furnished by Messrs. George Trollope and Sons, so as to illustrate the styles of the Elizabethan, Georgian and Queen Anne periods of interior decoration.

The Orangery and wings formed three sides of a court, the fourth side being formed by an open colonnade with the Royal Arms over the Great Archway in the centre. In front of and around the Pavilion a garden was laid out on a design by Mr. W. Goldring in the style originating in Holland and prevailing in England in the time of Queen Anne. The Pavilion was constructed by Messrs. George Trollope and Sons, of London, whose work gave great satisfaction. The Pavilion and garden were completed by the 30th April, the day upon which the Exhibition was inaugurated, and were open to the public during the whole period, except on days when receptions were held. Very large numbers passed through the building and grounds, and there can be no doubt that the Pavilion and its

surroundings formed one of the leading features of the Exhibition.

Receptions were held from time to time by the British Commission, and the Pavilion proved well adapted for the purpose. These Receptions took place on the occasion of International Congresses, such as the Congresses of Civil Engineers, Electrical Engineers, Mechanical Engineers, etc., when there were a considerable number of Foreign Representatives in St. Louis. During the period of the Exhibition the Pavilion was visited by many distinguished guests, including the President of the United States.

One of the most important Exhibits under the charge of the Royal Commission was the Collection of Jubilee Presents of Her late lamented Majesty Queen Victoria, which Your Majesty was most graciously pleased to lend to the Louisiana Purchase Exposition. Our Secretary secured for their display a large hall in the buildings of the Washington University of St. Louis, which stands on the Exhibition Grounds; and the place proved admirably adapted for the purpose. The building was fire-proof, and the entrances and exits were so arranged that crowding was avoided—an important consideration, having regard to the great numbers who visited the Presents. The total attendance during the period of the Exhibition exceeded one million visits. The Hall was guarded by London Metropolitan Police constables, whose services were lent by the Chief Commissioner of Police, to whom we wish to express our best thanks. The sergeant and five constables were excellent representatives of the London Police, and were of the greatest use in many ways, and their conduct was most satisfactory.

In the Department of Education the British Exhibit

was entirely collective. It was organised by the Education Committee of the Royal Commission, of which Mr. F. G. Ogilvie was Chairman. The Exhibit was arranged so as to illustrate the Educational system adopted in Great Britain and Ireland through all its different stages, from elementary schools to special Technical Schools and the Universities. A large number of different Institutions were represented. All the Universities in Great Britain and Ireland, many of the large Public Schools, and a considerable number of the important Technical Institutions contributed to the collection, which may be regarded as the best representation of the subject ever made outside the United Kingdom. The exhibit formed a clear and systematic exposition of the matter and methods of Education in the United Kingdom, while the valuable collections of school programmes and other documents available for reference, afforded to the interested visitor ample opportunity for detailed investigation. The same Committee were responsible for the Social Economy Exhibit. The prominent features of this were the diagrams of much interest contributed by the Board of Trade, the Post Office, Mr. Charles Booth, and several Municipalities. The whole indicated the more prominent movements in Social Economy in the United Kingdom.

The most important Department in the British Section was that of Art, for which the works were collected and arranged under the supervision of Sir Edward J. Poynter, Bart., P.R.A., Chairman of the Committee, which included the Presidents of nearly all the important Art Societies and Institutions in the country.

The Art Galleries consisted of a central building and two wings, besides a separate building for sculpture. The central building was allotted to the American

Section and the wings to the Foreign Sections, the east wing containing the collection of Great Britain, Germany, Sweden, Holland, Austria and Canada. The rooms set apart for Great Britain were spacious and well lighted. Thanks to the great zeal of the Art Committee and the energy of Mr. Isidore Spielmann, the Honorary Secretary, the British collection of works of Art sent to St. Louis was, in the opinion of many capable judges, the best and most important that has ever been sent out of England, and was by common consent admitted to be the best of the Foreign Sections at the Louisiana Exposition. It was thoroughly representative of the modern English School of painting in oil and water colour, and included many excellent examples of engraving, architectural drawing, and sculpture. Three of the rooms were allotted to an Applied Art Section, the exhibits for which were brought together and arranged by a sub-Committee under the Chairmanship of Mr. Walter Crane, the President of the Arts and Crafts Exhibition Society. This collection included jewellery, silver ware, glass and china, embroideries, and other objects of original Art Workmanship.

The British Section in the Department of Liberal Arts was extensive and interesting, the most important Exhibit being a Collection to illustrate the Chemical Industry in Great Britain, which was arranged by a sub-Committee of which Sir Boverton Redwood was Chairman. It included articles contributed by nearly one hundred of the leading chemical manufacturers and chemists of the United Kingdom, and was undoubtedly the best representation of this industry which has ever been shown at any International Exhibition out of England. In connection with the Chemical Exhibit, the Royal Commission showed a plant in operation for

the production of liquid air and hydrogen, on the principle adopted with such success by Sir James Dewar at the Royal Institution ; and arrangements were made for a series of lectures on the subject during the period of the Exhibition, which were well attended. The Low Temperature Exhibit proved a great success, and the plant was purchased at the close of the Exhibition by the United States Bureau of Standards, for permanent use in the Government Laboratories.

In the Liberal Arts Section there were also shown collective Exhibits of Books and Engravings, Photographs, Maps, Civil Engineering Models, etc. The Trinity House showed Models of Lighthouses and Lightships, and the Royal Mint contributed a very interesting exhibit of Coins and Medals, and a Collection of the facsimiles of the Great Seals of England for the past thousand years.

In the Department of Manufactures the British Section was not as complete as could have been desired, but the high Customs tariff of the United States on foreign goods had the effect of making British Manufacturers unwilling to send to the Exhibition, and in consequence many important branches of Industry were not represented : for example, cloth and cutlery were not shown at all. The principal products shown were Furniture, Ceramics, Lace, Irish Linens, and Cotton Machinery. The collective Exhibits of Ceramics and of Lace and Embroideries attracted much attention. The Collection of Lace and Embroideries, which was arranged by Mr. Alan S. Cole, C.B., was displayed in a special Court, which was decorated with reproductions of old pictures showing the application of lace and embroidery to dress. The Court formed an attractive feature of the British Section in the Varied Industries Building.

In the Department of Machinery also, British Industries were represented to a very small extent, as in this case, too, the protective tariff prevents the introduction of machinery into the United States, and manufacturers did not consider that the probable advantage to be gained by exhibiting would compensate them for the cost of showing their goods.

The British Section in the Department of Electricity included an excellent collective Exhibit of Instruments for Electrical measurements, and a historical display of the progress of Telegraphy made by the General Post Office.

In Transportation the British Exhibits were of an important and extensive character, including a large number of Ship's Models and Exhibits made by some of the leading Railway and Steamship Companies in England. The Prince of Wales was pleased to contribute models of the battleship "Albion," and of the Royal Mail Steamship "Ophir" in which His Royal Highness circumnavigated the world. The Cunard Steamship Company exhibited a set of models of special interest illustrating the growth of Ocean Steamships during the past sixty years.

The British Exhibits in the Department of Mines and Metallurgy were especially valuable. Your Majesty's Home Office contributed an interesting collection illustrative of British Mining during the last thirty years, which included specimens of Coal, Iron Ore and other Minerals supplied by more than 200 Mine and Colliery owners. The Board of Education sent a collection of Maps and Photographs to illustrate the results obtained by the Geological Survey of the United Kingdom, and the Department of Agriculture and Technical Instruction for Ireland showed a fine collection of Irish Building Stones and Minerals, and the Geological Survey of India

exhibited a collection illustrative of the work of the Department. There were also a number of private Exhibits, so that British Mining was well represented.

Great Britain was also well represented in the Departments of Agriculture and Horticulture. Among the Exhibits in the former was an interesting collection to illustrate the experiments carried out at Rothamsted by the Lawes Agricultural Trust; while a fine collection of British plants and flowers were shown in the Garden of the Royal Pavilion.

In the Departments of Forestry, Fish and Game was a Collective Exhibit of British sporting guns and rifles, contributed by a number of the best makers, and a collection to illustrate the work of the Marine Biological Association at Plymouth.

Our Secretary went to St. Louis for the second time in October, 1903, in order to make the final arrangements for the allotment of space for Great Britain and Ireland in the various Exhibition buildings and to study the arrangements for the transportation and installation of the goods. As it was evident that the congestion of traffic to the Exhibition would be considerable in consequence of the terminal arrangements at St. Louis, letters were sent to all British Exhibitors urging them to forward their Exhibits as early as possible in order to ensure the completion of the installation by the 30th April, 1904, the date fixed for the opening of the Exhibition. We also took steps to secure the timely despatch of the collective Exhibits organised under the Royal Commission, so that they might arrive before the congestion of traffic into the Exhibition became acute. The measures taken proved effective, and the British Sections were, with few exceptions, ready on the opening day.

The decoration of the British Courts was arranged in a manner different from that which had been adopted in previous International Exhibitions abroad. It had been the custom to leave to each Exhibitor the decoration of the space allotted to him, giving him liberty to put up such façades as he deemed desirable, subject only to the limitations of height and other conditions imposed by the regulations made by the Exhibition Authorities. Experience showed that the result left much to be desired, and in the case of the St. Louis Exhibition our Executive Committee decided to enclose the whole of the British space in each Building with an ornamental façade or enclosure, entered through archways inscribed with the words "Great Britain and Ireland." The design adopted for our façade and archways was uniform throughout the Exhibition, so that visitors could at once recognise the spaces occupied by Great Britain. The façade was decorated with groups of the British National Flags arranged at suitable intervals. The result of the scheme was eminently successful, and it was well worth the additional expense involved in carrying it out. The whole work of erecting the façade and of providing screens, flooring, and other necessary details of construction was carried out by Messrs. George Trollope and Sons, of London, who executed the work in a very satisfactory manner and completed it by the 30th April, notwithstanding considerable difficulties, in particular those due to the state of the labour market at St. Louis and the frequent strikes of the workmen.

On account of the large number of collective Exhibits organised by the Royal Commission, it was necessary to provide show-cases in considerable quantities. To have had these made in England and sent to

St. Louis would have entailed heavy cost for transport, and as it was found that they could be manufactured locally at a reasonable rate, a contract was made for their construction at St. Louis. The result was satisfactory; and in many instances it was possible to hire the plate glass for the cases instead of purchasing it, thus effecting a considerable economy. After the close of the Exhibition, the majority of the show-cases were disposed of locally, though at a considerable depreciation on the price originally paid.

The storage of the empty packing-cases during the period of an Exhibition is always an important consideration. It is necessary that they should be removed as soon as possible from the Exhibition Buildings, after the goods have been unpacked, that they should be safely stored during the Exhibition period, and promptly returned for repacking at its close.

At St. Louis a concession was given by the Exhibition Authorities to the General Service Company, who were allowed to erect warehouses in a remote part of the grounds and to charge a fixed rate for removing and returning cases, and storing them until required. In order to ensure the proper storing of the British cases, an arrangement was made with this Company whereby a definite portion of a warehouse was hired for the exclusive storage of British cases. This saved much time and trouble at the close of the Exhibition. On the whole, the system was fairly satisfactory, although in certain particulars work was unnecessarily thrown on the Staff of the Royal Commission.

A principal cause of delay, both in the original installation, and still more in the removal of Exhibits after the close, was due to the United States Custom House regulations. By the Act of Congress

authorising the Exhibition it was enacted that articles sent for exhibition should be admitted free of duty, provided that they were re-exported; but this, though apparently a simple matter, was seriously complicated by the elaborate system of checks adopted by the United States Custom House Authorities, with a view to ensure that nothing should remain in the United States without paying duty. Every article, however small, had to be checked and scheduled by a Custom House Officer before being installed for exhibition, and re-checked before it was allowed to be packed for return to England. In many cases this caused weeks of delay in repacking, especially as the amount of work was greater than the Custom House Staff could manage. Under United States laws articles presented to certain public Institutions are exempted from duty, but, in the case of articles so presented by the Royal Commission or by Foreign Exhibitors, the formalities to be gone through were very complicated. Articles sold for delivery at the end of the Exhibition were, of course, charged with duty, as were also articles stolen during the Exhibition; but of these latter there were fortunately few so far as British Exhibits were concerned.

As a large number of the British Exhibits were collective and the Exhibitors had no representative of their own at St. Louis, the Royal Commission undertook the sale of certain articles for delivery at the close of the Exhibition. The total value of the sales effected was as follows :—

	£	s.	d.
Department of Art . . .	7,444	1	1
Department of Manufactures . . .	392	3	3
Other Departments . . .	159	5	9
Total . . .	£7,995	10	1

Out of the amount received from purchasers the cost of Customs duties and other expenses were paid, and the balance was handed over to the Exhibitor. The Sales Account was kept completely separate from the General Account of the Royal Commission. The Custom House Regulations of the United States made the business of sales very complicated.

The Catalogue of the British Section was prepared in London, and was ready for issue by the opening day. There was a separate Catalogue for each Department; these bound together formed the complete Catalogue. The system of Departmental Catalogues was found very convenient; and they had a readier sale than the more bulky volumes of the complete Catalogue. The Catalogue for which there was the largest demand was that of Her Majesty Queen Victoria's Jubilee Presents, 13,482 copies having been sold during the Exhibition period. The timely issue of the British Catalogue was found to be particularly convenient, owing to the fact that the American Official Catalogue was late in publication. A preliminary edition of this was issued soon after the Exhibition opened; but it required much revision, and the complete edition was not ready before the first week in November.

The meeting of the Jury of Awards is always an important episode in an International Exhibition. According to the Regulations for the St. Louis Exhibition, the Jury should have assembled on the 1st June, 1904; but as the weather in St. Louis during the summer is usually very hot, and as the installation of many Exhibits was not really completed until long after the opening day, it was decided to postpone the date of meeting to the 1st September.

There were three classes of Juries, *i.e.*, Group Juries, of which there were 144 ; Department Juries, of which there were 15 ; and a Superior Jury. The Group Juries were in most instances composed of Americans and Foreigners in equal numbers. Each Jury elected its Chairman and Vice-Chairman, of whom the one, generally the Chairman, was American, and the other Foreign. The Department Juries consisted of the Chairman and Vice-Chairman of each of the Group Juries, with two additional American Members. As in the case of the Group Juries, each Department Jury elected its Chairman and Vice-Chairman, of whom the one was American and the other Foreign. The last or Superior Jury, of which the President of the Exhibition was President, was composed of the Director of Exhibits, a Citizen of the United States nominated by the National Commission, the Chiefs of all Departments, the Chairmen and Vice-Chairmen of the Department Juries, and twelve of the Foreign Commissioners-General representing the countries who had sent the most important Foreign Exhibits. The Superior Jury consisted in all of thirty-four American and twenty-seven Foreign Representatives ; there were four Vice-Presidents, of whom two were American and two Foreign.

The British Group Jurors, of whom there were seventeen, were selected by the Committees of the Royal Commission dealing with the different subjects, and were approved by the Executive Committee. That the selections were satisfactory was proved by the fact that in eleven instances the British Juror was elected as Chairman or Vice-Chairman of the Group Jury and thus became a member of the Department Jury. Two were again elected as Vice-Chairmen of the Department

Juries and became members of the Superior Jury, upon which Great Britain had three Representatives, *i.e.*, the two Jurors and the Commissioner-General who was a Member *ex-officio*.

The Awards were of four orders of merit, as follows :—

GRAND PRIZES.

GOLD MEDALS.

SILVER MEDALS.

BRONZE MEDALS.

All Exhibits were examined by the Group Juries, who recommended the Awards to be given and forwarded the lists to the Department Juries for consideration. The Department Juries approved or revised the recommendations of the Group Juries and submitted their decision to the Superior Jury, whose decision was final after review of every case in which Exhibitors asked for reconsideration. As by the Regulations of the Exhibition the Superior Jury had to terminate its business by the 15th October, 1904, and as a certain number of appeals were not settled by that date, these were referred to a standing Committee, consisting of the President and Vice-Presidents of the Superior Jury, who were empowered to continue until all business was completed. The work of the Juries was carried out in a very satisfactory manner, and British Exhibitors were quite content with the decisions. In a few cases appeals were made, and these were fairly and fully considered by the Superior Jury.

The British Exhibits in Art, Education, and Social Economy were withdrawn from competition with the sanction of our Executive Committee, and, in the other Departments of the Exhibition in which British

Exhibitors entered into competition, the number of awards were as follows :—

To Exhibitors.	GRAND PRIZES . .	126
	GOLD MEDALS . .	204
	SILVER MEDALS . .	129
	BRONZE MEDALS . .	77
To Collaborators.	GRAND PRIZES . .	7
	GOLD MEDALS . .	43
	SILVER MEDALS . .	38
	BRONZE MEDALS . .	54

We consider that it is specially satisfactory that so high a proportion of superior awards were given, as it shows that the British Exhibits were regarded by the Juries as having a high degree of excellence. We wish to express our sense of gratitude to the British Jurors, who undertook this long and arduous duty, some of them at considerable personal inconvenience, and whose impartial efforts secured full consideration by the different Juries of the claims of the various Exhibitors.

The relations of the Executive Staff of the Royal Commission with the Exhibition Authorities, the United States National and States Commissions, and the Foreign Commissions were cordial. On several occasions the British Royal Pavilion, which was better provided with offices than the other Foreign Pavilions, was used as a meeting place of the Foreign Commissioners-General for the discussion of questions of common interest with reference to Exhibition matters; and these meetings led to good results in many ways.

The period of the Exhibition was marked by many public and private entertainments, most of which were held in the grounds at the Foreign and State Pavilions. We have already alluded to Receptions held at the

Royal Pavilion ; in addition to these, the British Commissioner-General entertained largely at his residence in return for the hospitality which he received. The social side of the Exhibition was not without its value, and the result of the meeting on common ground of the representatives of many nations and the friendly relations that were established among them may, it is to be hoped, extend beyond the immediate scope of the Exhibition.

The interest which the Prince of Wales took in the work of the Royal Commission was of the greatest help, both during the preliminary period of preparation and during the progress of the Exhibition. It is not too much to say that the fact that Your Majesty was graciously pleased to appoint His Royal Highness as President of the Commission was a main cause of the success which we trust we may be justified in claiming.

We desire to express our appreciation of the services rendered by the Executive Staff of the Royal Commission. Their work was in some respects more arduous than at previous Exhibitions, in consequence of the adoption of the system of Collective Exhibits, entailing on the Staff duties which otherwise would have fallen to private Exhibitors. The work was also considerably increased by the negotiations for the sale of articles from the Collective Exhibits.

We would especially call attention to the services rendered by Mr. Isidore Spielmann, who, in addition to his duties as Honorary Secretary and Member of the Art Committee, was so good as to act as Honorary Assistant Secretary to the Royal Commission, and took charge of our London Office during the whole period of the Exhibition.

We regret to have to record the death of one

member of our body, Sir Clement Le Neve Foster, F.R.S., who served on the Committee for Mines and Metallurgy and worked assiduously at the preparation of the British Exhibits in that Department.

We cannot close this Report without expressing our high appreciation of the admirable manner in which every part of his work and responsible duties was performed by Colonel Watson, both as Secretary to the Commission and as British Commissioner-General.

In conclusion, we venture to express the hope that we have given proper effect to the Commission which Your Majesty was graciously pleased to confide in us.

GEORGE, P., President.

PEEL, Chairman.

JERSEY.

CASTLETOWN OF UPPER OSSORY.

ALVERSTONE, C.J.

HORACE PLUNKETT.

C. W. FREMANTLE.

EDWARD J. POYNTER.

E. MAUNDE THOMPSON.

W. T. THISELTON-DYER.

J. BENJAMIN STONE.

C. P. CLARKE.

HENRY CUNYNGHAME.

C. V. BOYS.

HOWE.

INVERCLYDE.

AVEBURY.

C. N. LAWRENCE.

GEORGE HAYTER CHUBB.

C. RIVERS WILSON.

W. H. PREECE.

HERBERT JEKYLL.

L. ALMA-TADEMA.

GEORGE T. LIVESEY.

EDWIN A. ABBEY.

THOS. BROCK.

GEORGE DONALDSON.

J. C. HAWKSHAW.

THOS. G. JACKSON.

W. H. MAW.

F. G. OGILVIE.

W. Q. ORCHARDSON.

BOVERTON REDWOOD.

ALFRED GORDON SALAMON.

J. W. SWAN.

J. J. H. TEALL.

C. M. WATSON,

Secretary.

SPEECH OF H.R.H. THE PRINCE OF
WALES, K.G.,

*At the First Meeting of the Royal Commission, held at
Marlborough House, April 28th, 1903.*

MY LORDS AND GENTLEMEN,

It gives me much pleasure to meet here to-day the Members of the Royal Commission for the St. Louis Exhibition, to the Presidency of which I have had the honour to be nominated by the King.

The preliminary work of the Commission has been to a great extent already carried out by the Committee appointed by His Majesty's Government in February last, under the able chairmanship of my noble friend Lord Peel, and the Departmental Committees, and I feel that my thanks are due to these gentlemen for having thus prepared the ground for our labours.

In accepting the invitation of the President of the United States to take part in the great International Exhibition which is to be held in St. Louis in 1904, His Majesty's Government felt that it was desirable that the United Kingdom should be adequately represented at this concourse of the Nations.

The Official classification of the different Departments of the Exhibition explains, better than any description, the scope of the undertaking, and it is evident that this classification has been very carefully prepared by the Exhibition Authorities. It will be noticed that the Departments of Education and Art are placed first on the list; and I understand that it is particularly desired that Great Britain should be worthily represented in these branches—a hope which I have no doubt will be fulfilled.

His Majesty the King, who takes much interest in the Exhibition, has consented to lend the collection of Jubilee presents of Her late Majesty Queen Victoria; and I am sure that this loan will be much appreciated.

The time which is available for preparation is somewhat short, as it has been decided that the Exhibition is to be opened on 1st May, 1904. Every effort has therefore to be made to arrange as soon as possible for the Exhibits in those Departments in which Great Britain will be represented.

I trust that the members of the Corporations, Chambers of Commerce, and other public bodies at the various centres of industry, will also co-operate in promoting the success of the British Section at the Exhibition.

An idea is sometimes put forward that it is not of much use for British Manufacturers to exhibit in the United States, as the high Customs Tariff in that Country tends to militate against the sale of British products. It should, however, be remembered that there is a considerable market for high-class goods in the United States, and also that the Exhibition will afford an opportunity of showing our manufactures to customers from South America, Canada, and other Countries. It may be observed that both France and Germany appear fully to realise the advantages to be gained by making a good display of their productions, and in these countries large sums have been provided by their respective Governments to assist in meeting the expense of the Exhibits.

There is one point to which it would seem desirable to direct attention. In previous International Exhibitions, while other Countries have arranged to have combined National displays in certain groups, it has been the habit for British Manufacturers to show individual exhibits, rather than to combine together so as to produce the best possible effect. It is hoped that in the case of the St. Louis Exhibition it may be possible to arrange so that Exhibitors will combine in order to display British products to the best advantage. It should be remembered that the competition will not be between individual British Manufacturers, but between them as a whole and their foreign rivals.

As regards the amount which will be available to carry out the work of the Royal Commission, I understand that His Majesty's Government has included a sum of £30,000 in the Estimates for 1903-4 as a commencement, and that a decision will not be arrived at as to the total amount to be granted until it has been ascertained to what extent British Manufacturers show a willingness to take part in the Exhibition. I feel sure

that a sufficient sum will be given to enable the Royal Commission to fulfil their duties in a satisfactory manner.

In conclusion, I would express the hope that the representations of this Country in the various Departments of the Exhibition may be worthy of the British Empire.

LIST OF COMMITTEES.

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R. Blair, Esq.
S. J. Cartlidge, Esq.

† Deceased.* The Secretary of the Royal Commission is *ex-officio* a member of all Committees.

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J. Struthers, Esq., C.B.

J. H. Cundall, *Secretary*.

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Walter Crane, Esq., R.W.S., P. Arts and Crafts E. Soc.

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(Original Objects of Art-Workmanship.)

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H. A. Grueber, Esq., F.S.A. (Egypt Exploration Fund).

Arthur John Evans, Esq., M.A., F.R.S., F.S.A. (Cretan Exploration Fund).

George A. Macmillan, Esq., J.P. (Cretan Exploration Fund).

Colonel D. A. Johnston, R.E., C.B. (Ordnance Survey).

Major-General James Waterhouse (Survey of India).

Major E. H. Hills, R.E., C.M.G. (Intelligence Division of the War Office).

Dr. J. Scott Keltie, F.S.A. (Royal Geographical Society).

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(*Electricity.*)

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J. H. Cundall, *Secretary of both Committees.*

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Right Hon. Lord Castletown, C.M.G.

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Most Noble the Marquis of Granby.

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Sir W. T. Thiselton-Dyer, K.C.M.G., C.I.E.

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(DEPARTMENT L.)

H. H. S. Cunynghame, Esq., C.B., *Chairman.*

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Professor Gowland.

F. J. Jones, Esq.

Dr. T. K. Rose.

J. J. H. Teall, Esq., F.R.S.

Edmund H. Lloyd, *Secretary.*

† Deceased.

RULES FOR DEPARTMENTAL COMMITTEES OF THE ROYAL COMMISSION.

I.—CONSTITUTION.

Each Committee shall consist of:—

- 1.—A Chairman who is a member of the Executive Committee of the Royal Commission.
- 2.—Members who are not necessarily members of the Royal Commission, but whose technical knowledge is of such peculiar value that their co-operation and advice are desirable.
- 3.—The Secretary of the Royal Commission who is *ex-officio* a member of all Departmental Committees.
- 4.—A Secretary appointed from the Staff of the Royal Commission, whose services shall be unpaid.

II.—FUNCTIONS.

- 1.—The Committee shall consider in what Groups, if any, an Exhibit shall be organised.
- 2.—A report shall be made to the Executive Committee as to the total space required in the Department.
- 3.—Steps shall be taken to consider how the best representation of the objects and industries mentioned in the classification can be secured, so as to obtain a collective British Exhibit of the best articles in each Group.
- 4.—The Committee shall furnish the Executive Committee with lists of names of firms and others whose participation in the Exhibition is desirable, and to whom forms of application should be sent.
- 5.—The Committee shall not make any engagement as to space, the allotment of space being made by the Executive Committee, upon the recommendation of the Departmental Committees. Care should be taken to

avoid saying anything to manufacturers and others which could be construed into promises of definite allotment of space.

- 6.—All printed matter, forms, and stationery that may be required, shall be furnished to the Committee by the Royal Commission.

III.—FINANCE.

- 1.—The Committee shall furnish the Finance Committee with an estimate of expenditure likely to be incurred.
 - 2.—The Committee is not authorised to incur any liability for expenditure without the previous sanction of the Finance Committee.
 - 3.—The Committee shall hand all accounts for payment to the Accountant of the Royal Commission.
 - 4.—Claims for travelling expenses and allowances shall be made on special forms supplied for the purpose, and shall only be allowed on the Scale sanctioned by the Treasury, if approved by the Finance Committee.
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Executive Staff of the Royal Commission.

COLONEL SIR C. M. WATSON, R.E., K.C.M.G., C.B.,	
	<i>Secretary of the Royal Commission and Commissioner-General for Great Britain.</i>
SIR ISIDORE SPIELMANN, F.S.A.	<i>Honorary Assistant Secretary.</i>
J. H. CUNDALL	} <i>General Superintendents.</i>
EDMUND H. LLOYD	
LUCIEN SERRAILLIER ..	{ <i>Secretary to the Commissioner-General and Secretary for Juries.</i>
C. D. BARRETT	<i>Accountant.</i>
HERBERT LANGRIDGE ..	<i>Chief Clerk and in charge of Catalogue.</i>
CAPTAIN P. H. ATKIN ..	<i>Representative of the Education Committee.</i>
R. S. HUNT	<i>Representative of the Art Committee.</i>
ALFRED A. LONGDEN	<i>Representative of the Applied Art sub-Committee.</i>
J. E. PETAVEL	<i>Scientific Manager of the Low Temperature Exhibit.</i>
L. E. ADAMS, B.A. ..	{ <i>Curator of the Exhibit of the Marine Biological Association.</i>
A. E. BANHAM	<i>Assistant Superintendent (Education).</i>
J. F. BARRETT	<i>Assistant Superintendent (Mines and Metallurgy).</i>
JOHN E. BLACKNELL ..	<i>Assistant Superintendent (Manufactures).</i>
THOMAS J. CHRISTIE † ..	<i>Assistant Superintendent (Liberal Arts).</i>
HAROLD DARBY	<i>Assistant Superintendent (Transportation).</i>
JOSEPH DEVLIN	{ <i>Assistant Superintendent (Agriculture, Forestry, Fish and Game).</i>
EDWARD DIXON	<i>Assistant Superintendent (Electricity).</i>
C. E. DOWN	<i>Assistant Superintendent (Education).</i>
W. C. FORSTER	{ <i>Assistant Superintendent (Queen Victoria's Jubilee Presents).</i>
H. PAYNE	<i>Assistant Superintendent (Low Temperature Exhibit).</i>
H. WERNINCK	{ <i>Assistant Superintendent (Chemical and Pharmaceutical Arts).</i>

† Deceased.

O. PELLY DICK ..	..	..	..	}	<i>Clerical Assistants.</i>
J. PERRIN HARRIS	..	..	..
A. A. MADDEN ..	..	..	..
D. BANFIELD ..	..	}	<i>Clerical Assistants, temporarily engaged.</i>		
A. BROCK ..	..			
E. L. CHAPIN ..	..			
A. G. CHUTER ..	..			
R. GRANT DALTON	..				
S. G. HUTCHINSON	..				
N. WELTIN ..	..			
W. BROWN ..	<i>In charge of the British Royal Pavilion Garden.</i>				
ARTHUR SMITH ..	..	..	..	..	<i>General Foreman.</i>
THOMAS SELL ..	..	..	..	..	<i>Messenger.</i>

Architects of the British Royal Pavilion.

MESSRS. ERNEST GEORGE & YEATES, 18 Maddox Street, London, W.

Designer of the British Royal Pavilion Garden.

W. GOLDRING, F.R.H.S., Kew, London.

Bankers.

LONDON :—LONDON AND WESTMINSTER BANK, 1 St. James' Square, S.W.

ST. LOUIS :—THE MISSISSIPPI VALLEY TRUST COMPANY.

Solicitors.

MESSRS. RAWLE, JOHNSTONE & COMPANY, 1 Bedford Row, London, W.C.

Official Passenger Agents.

MESSRS. THOMAS COOK & SON, Ludgate Circus, London, E.C.

Offices of the Royal Commission.

LONDON :—47, VICTORIA STREET, S.W.

ST. LOUIS :—BRITISH ROYAL PAVILION, LOUISIANA PURCHASE EXPOSITION.

REPORT OF THE FINANCE COMMITTEE.

BY THE RIGHT HON. VISCOUNT PEEL.

The Finance Committee was appointed at the Meeting of the Royal Commission held under the Presidency of His Royal Highness the Prince of Wales on the 28th April, 1903, and was composed as follows :—

The Right Hon. Viscount Peel, Chairman.

The Hon. Sir C. W. Fremantle, K.C.B.

Colonel Sir H. Jekyll, R.E., K.C.M.G.

The Hon. C. N. Lawrence.

Sir George Donaldson.

Colonel Sir C. M. Watson, R.E., K.C.M.G., C.B., Secretary.

The Right Hon. Lord Alverstone, G.C.M.G., and Mr. F. G. Ogilvie were added to the Committee afterwards.

The duty of the Committee was to administer the finances of the Royal Commission and to supervise all expenditure.

In March 1903 the Treasury informed the Royal Commission that a sum of £30,000 had been included in the Estimates for 1903–4 for expenditure in connection with the St. Louis Exhibition, and that the total amount to be allotted would depend upon the extent to which it was found that an adequate representation of British Arts and Manufactures could be secured.

In order to frame the estimate desired by the Treasury each Committee of the Royal Commission was requested to consider the amount which would be required for organising and installing the British Exhibits in its own Department, and upon these reports an estimate was prepared which amounted to £164,230. After some correspondence the Treasury agreed to apply for a sum of £150,000, of which £80,000, included in the Estimates for 1903–4, and £70,000, in the Estimates for 1904–5, were voted by Parliament.

The Treasury authorised the free postage of Inland letters, the provision of offices by the Office of Works, at the expense of the Royal Commission, and, at the special request of the latter, a monthly audit of the accounts by the Exchequer and Audit

Department. Forms for keeping the accounts were prepared and approved by the Treasury.

The Royal Commission kept the Treasury informed of the amounts which they required from time to time, and grants were made as follows :—

	£	s.	d.
11th March, 1903	2,000	0	0
31st July, 1903	2,000	0	0
14th September, 1903	5,000	0	0
19th September, 1903	6,000	0	0
26th November, 1903	20,000	0	0
29th January, 1904	35,000	0	0
1st February, 1904	10,000	0	0
26th May, 1904	40,000	0	0
28th December, 1904	30,000	0	0
Total.	£150,000	0	0

With the authority of the Treasury it was decided to keep the accounts of the Royal Commission with the London and Westminster Bank, with whom three accounts were opened, viz.,

1. Deposit Account, bearing interest.
2. Current Account.
3. Petty Cash Account.

The sums authorised by the Treasury were paid into the Bank by the Paymaster-General and were placed to the credit of the Deposit Account; transfers from the Deposit to the Current Account were made as required, and from the Current Account to the Petty Cash Account. Cheques on the Current Account required the signature of two members of the Finance Committee and the Secretary, and Cheques on the Petty Cash Account were signed by the Secretary or Honorary Assistant Secretary alone.

As a large proportion of the payments were made at St. Louis, an account was opened with the Mississippi Valley Trust Company in May 1903. As interest was allowed by the Bank on monthly balances it was not considered necessary to open a Deposit Account. Cheques on the St. Louis account were signed by the Secretary or by Mr. L. Serraillier, who acted as Resident Representative from May 1903 until the arrival of the British Commissioner General at St. Louis in February 1904. The Mississippi Valley Trust Company kept the accounts in a very satisfactory manner, and the Committee are much indebted

to them for the assistance that they rendered in various ways to the Royal Commission during the period of the Exhibition. At the close of the work at St. Louis the balance remaining was transferred to the London and Westminster Bank.

The Secretary of the Royal Commission acted as accounting officer. He was assisted by Mr. C. D. Barrett, of the Accountant General's Department at the War Office, whose services were placed at the disposal of the Commission by the Secretary of State for War, with the concurrence of the Treasury. Mr. Barrett carried out his duties, which at times were very arduous, in a most satisfactory manner, and the Committee wish to take this opportunity of expressing their recognition of the assistance which he gave them in the financial work.

As the Royal Commission undertook the sales of certain articles on behalf of British Exhibitors, a second account was opened with the Mississippi Valley Trust Company called "The Sales Account." All moneys received in respect of sales were paid into this account and from it were paid the charges for Customs and other expenses. The balance was transferred to a "Sales Account" with the London and Westminster Bank, on which cheques were drawn in favour of the different persons whose exhibits were sold. The total amount received for sales by the Royal Commission was £7,995 10s. 1d.

The rates of exchange between England and the United States varied considerably, but for purposes of account a fixed rate was taken, the actual loss or gain being shown on each monthly account.

The accounts sent to the Auditor General were of two classes, viz., a monthly account, and an annual account which included all receipts and expenditure in each financial year. The monthly accounts were supported by the necessary vouchers and were approved by the Finance Committee.

A grant was made to each Committee of the Royal Commission for expenses in connection with the exhibits in its own Department, but no money was transferred to the Committees; the accounts being kept by the Accountant of the Royal Commission, and all payments, when duly certified by the Chairman or Secretary of the Committee, were made from the central office.

A large proportion of the exhibits in the British Section were "Collective Exhibits." In the case of these the goods were lent

by the manufacturers or owners, and the cost of transportation, installation and insurance was borne by the Royal Commission. If this arrangement had not been adopted the British Section would have been small, as few manufacturers were willing to incur the cost of sending goods for exhibition to the United States, where the high protective tariff restricts imports from foreign countries.

The scale of travelling and subsistence allowances approved by the Treasury for Temporary Commissions was adhered to so far as journeys in the United Kingdom were concerned, but, when the Staff were removed to St. Louis it was found necessary to adopt a higher scale for subsistence allowance, owing to the high cost of living in the United States, more especially at the period of an International Exhibition.

The following scale was therefore approved :—

Secretary to the Royal Commission, £3 3s. 0d. per diem.

Superior Members of the Staff, £2 2s. 0d. per diem.

Other Members of the Staff, £1 1s. 0d. per diem.

No charge was made to exhibitors for space, as this was supplied free by the Exhibition Authorities. The façades round the spaces allotted to Great Britain in the different buildings were provided at the cost of the Royal Commission, and in the case of Collective Exhibits show-cases and screens were also provided. A large number of show-cases had therefore to be purchased, and as it was found that they could be procured at a reasonable rate at St. Louis, a contract was made for their provision locally, thus saving the cost of transport. Considerable economy was effected by hiring the plate glass for the period of the Exhibition in place of purchasing it. At the close of the Exhibition it was found possible to dispose of the show-cases, but of course at a reduction on the original prices.

Each of the British Group Jurors received a sum of £150 to cover all expenses. Those who were retained at St. Louis to act as members of the Department Jury received an additional allowance of £25, while one who remained until a later date to serve on the Superior Jury was given a further grant of £25. The total amount expended on British Jurors, including clerical assistance, was £2,537 0s. 8d.

Income tax was deducted from the salaries of the Staff and paid to the Inland Revenue Department. The Secretary of the

Royal Commission and Colonel Sir H. Jekyll, R.E., K.C.M.G., were appointed to act as assessors, and Mr. Barrett, the accountant, acted as collector.

The Committee recommended to the Executive Committee that gratuities should be given to the Members of the Staff on completion of their duties with the Royal Commission, in consequence of the arduous nature of the work and the moderate scale on which the salaries were calculated. This recommendation was approved by the Executive Committee.

A statement of accounts showing the net cost up to the 31st July, 1905, is annexed. The work of the Royal Commission cannot yet be closed, as the Diplomas and Medals for exhibitors have not been received from the Exhibition Authorities, and some outstanding questions remain to be settled. As, however, it would not be desirable to defer the issue of the Report, the accounts have been made up to the 31st July, 1905, and as soon as the work of the Royal Commission is quite complete, a supplementary account will be forwarded to the Treasury, together with the balance that remains unexpended.

PEEL,

Chairman of the Committee.

STATEMENT OF NET COST TO 31ST JULY, 1905.

	£	s.	d.
Salaries and Wages	9483	5	9
Travelling and Subsistence	10800	8	4
Rents and Office Expenses	2974	17	4
Royal Pavilion and Garden	31829	0	8
The Queen's Jubilee Presents	2180	8	8
EXHIBITS :—			
	£	s.	d.
Education and Social Economy	4142	3	9
Fine Art and Applied Art	14627	3	11
Typography, Books and En- gravings	829	12	10
Photography	651	17	11
Geography and Exploration	497	12	10
Instruments of Precision, Coins and Medals	808	11	6
Chemical and Pharmaceutical Arts	10187	3	3
Civil Engineering	1352	5	10
Ceramics	1820	2	9
Lace and Embroidery	4351	12	11
Machinery and Electricity	2620	7	11
Transportation	1334	18	0
Agriculture, Forestry, Fish and Game	2764	4	4
Mines and Metallurgy	2134	19	4
	<hr/>		
	48122	17	0
Freight	1097	9	11
Insurance	95	9	8
Installation and Decoration	5839	19	6
Storage of Empty Cases	823	8	5
Catalogues	706	12	8
Expenses of Jurors	2489	12	6
Expenses of Metropolitan Police at St. Louis	1396	17	2
Entertaining	1346	8	9
Stationery and Printing	902	7	6
Miscellaneous Expenses	1542	1	8
	<hr/>		
Total	121631	5	6

EDUCATION AND SOCIAL ECONOMY.

	£	s.	d.
Salaries and Wages	1320	9	10
Travelling and Subsistence	1116	19	10
Collecting, Packing and Redistribution	95	13	2
Freight	159	2	5
Insurance	117	2	2
Installation and Decoration	1266	11	10
Cost of Exhibits	32	14	2
Stationery and Printing	51	0	8
Incidental Expenses	36	19	2
	4196	13	3
Receipts	54	9	6
Net Cost of Exhibit	4142	3	9

FINE ART AND APPLIED ART.

	£	s.	d.
Salaries and Wages	1969	9	0
Travelling and Subsistence	2360	0	8
Collecting, Packing and Redistribution	2520	4	7
Freight	2535	19	10
Insurance	2898	4	10
Installation and Decoration	2265	1	0
Stationery and Printing	177	7	0
Incidental Expenses	106	1	10
	14832	8	9
Receipts	205	4	10
Net Cost of Exhibit	14627	3	11

TYPOGRAPHY, BOOKS AND ENGRAVINGS.

	£	s.	d.
Salaries and Wages	122	8	9
Collecting, Packing and Redistribution	13	15	2
Freight	93	9	3
Insurance	88	7	5
Installation	523	0	10
Stationery and Printing	28	15	0
Incidental Expenses		2	2
	869	18	7
Receipts	40	5	9
Net Cost of Exhibit	829	12	10

PHOTOGRAPHY.

	£	s.	d.
Salaries and Wages	89	18	10
Travelling and Subsistence	157	10	0
Collecting, Packing and Redistribution	32	13	10
Freight	92	14	10
Insurance	53	9	4
Installation	210	8	9
Stationery and Printing	16	15	0
Incidental Expenses	5	8	4
	658	18	11
Receipts	7	1	0
Net Cost of Exhibit	651	17	11

GEOGRAPHY AND EXPLORATION.

	£	s.	d.
Salaries and Wages	89	18	11
Collecting, Packing and Redistribution	13	2	3
Freight	57	2	4
Insurance	72	14	5
Installation	268	14	10
Stationery and Printing	12	17	6
Incidental Expenses	1	2	8
	<hr/>		
	515	12	11
Receipts	18	0	1
	<hr/>		
Net Cost of Exhibit	497	12	10
	<hr/>		

INSTRUMENTS OF PRECISION, COINS AND MEDALS.

	£	s.	d.
Salaries and Wages	89	18	10
Collecting and Packing	1	15	4
Cost of Exhibit	138	0	0
Freight	77	18	3
Insurance	68	18	10
Installation	451	7	5
Stationery and Printing	6	8	9
	<hr/>		
	834	7	5
Receipts	25	15	11
	<hr/>		
Net Cost of Exhibit	808	11	6
	<hr/>		

CHEMICAL AND PHARMACEUTICAL ARTS.

	£	s.	d.
Salaries and Wages	2480	4	1
Travelling and Subsistence	830	8	9
Collecting, Packing and Redistribution	23	13	4
Cost of Exhibits	2420	0	7
Freight	1396	11	3
Insurance	380	11	8
Installation	3629	10	5
Stationery and Printing	136	17	7
Building and Construction	488	17	9
Incidental Expenses	80	11	5
	11867	6	10
Receipts	1680	3	7
Net Cost of Exhibit	10187	3	3

CIVIL ENGINEERING.

	£	s.	d.
Salaries and Wages	89	18	10
Travelling	12	17	2
Collecting, Packing and Redistribution	139	11	1
Freight	686	7	1
Insurance	106	14	8
Installation	296	9	7
Stationery and Printing	12	17	6
Incidental Expenses	7	19	3
	1352	15	2
Receipts		9	4
Net Cost of Exhibit	1352	5	10

CERAMICS.

	£	s.	d.
Salaries and Wages	329	6	8
Collecting	75	0	0
Freight	255	12	9
Insurance	104	8	0
Installation	1093	13	4
Stationery and Printing	5	2	6
Incidental Expenses	3	16	8
	<hr/>		
	1866	19	11
Receipts	46	17	2
	<hr/>		
Net Cost of Exhibit	1820	2	9
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LACE AND EMBROIDERY.

	£	s.	d.
Salaries and Wages	326	2	6
Travelling and Subsistence	427	16	10
Collecting, Packing and Redistribution	9	2	5
Freight	122	1	1
Insurance	123	4	2
Cost of Exhibit	6	16	3
Installation	3349	0	8
Stationery and Printing	5	10	10
Incidental Expenses	9	6	0
	<hr/>		
	4379	0	9
Receipts	27	7	10
	<hr/>		
Net Cost of Exhibit	4351	12	11
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MACHINERY AND ELECTRICITY.

	£	s.	d.
Salaries and Wages	569	9	7
Travelling and Subsistence	369	9	11
Collecting and Packing	18	2	8
Freight	313	10	8
Insurance	161	15	8
Cost of Exhibit	373	17	6
Installation and Decoration	822	15	8
Stationery and Printing	8	16	7
Incidental Expenses	24	15	0
	<hr/>		
	2662	13	3
Receipts	42	5	4
	<hr/>		
Net Cost of Exhibit	2620	7	11
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TRANSPORTATION EXHIBITS.

	£	s.	d.
Salaries and Wages	499	0	2
Travelling	18	18	3
Collecting and Packing	6	4	11
Freight	143	0	7
Insurance	141	15	3
Installation	538	17	0
Stationery and Printing	7	10	0
Incidental Expenses	3	0	0
	<hr/>		
	1358	6	2
Receipts	23	8	2
	<hr/>		
Net Cost of Exhibit	1334	18	0
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AGRICULTURE, FORESTRY, FISH AND GAME.

	£	s.	d.
Salaries and Wages	628	11	1
Travelling and Subsistence	565	7	10
Collecting, Packing and Redistribution	71	7	4
Freight	340	15	7
Insurance	211	18	6
Cost of Exhibits	87	19	7
Installation	852	18	6
Stationery and Printing	26	14	5
Incidental Expenses	23	14	7
	2809	7	5
Receipts	45	3	1
Net Cost of Exhibit	2764	4	4

MINES AND METALLURGY.

	£	s.	d.
Salaries and Wages	539	4	8
Travelling and Subsistence	280	6	2
Collecting, Packing and Redistribution	40	16	2
Freight	227	4	5
Insurance	49	3	4
Cost of Exhibit	273	18	3
Installation	731	16	11
Incidental Expenses	4	16	11
	2147	6	10
Receipts	12	7	6
Net Cost of Exhibit	2134	19	4

REPORT ON THE EXHIBIT OF THE JUBILEE PRESENTS OF THE LATE QUEEN VICTORIA.

BY PROFESSOR WYNDHAM DUNSTAN, M.A., F.R.S.

One of the most important exhibits under the charge of the Royal Commission was the Collection of Jubilee Presents of Her late lamented Majesty Queen Victoria, which His Majesty the King was most graciously pleased to lend to the Louisiana Purchase Exposition after being on exhibition in Toronto in the autumn of 1903.

The selection and arrangement of the Presents were entrusted by His Majesty the King to Professor Wyndham Dunstan, M.A., F.R.S., and Sir C. Purdon Clarke, C.V.O., C.I.E., F.S.A.

The Secretary of the Royal Commission secured from the Exhibition Authorities for their display a large hall measuring 6,750 square feet in one of the Buildings of the Washington University of St. Louis, which were used as the headquarters of the Administration of the Exhibition. The hall proved to be admirably adapted for the purpose. The building was fireproof, and the entrance and exit were so arranged that crowding was avoided.

The Presents were received in St. Louis several months before the Exhibition opened, and arrangements were made by the Representative of the Royal Commission for them to be stored in the vaults of the Mississippi Valley Trust Company of St. Louis, which proved to be satisfactory. Immediately the staff of the Royal Commission arrived the Presents were removed and arranged for exhibition, the Authorities providing a special detail of the Jefferson Guard for the purpose of protecting them during the hours when it was impossible for the Royal Commission to be represented.

During the hours the collection was open to the public it was guarded by London Metropolitan Police Constables, whose services were lent to the Royal Commission by the Chief Commissioner of Police, and their appearance and conduct during the term of their stay in St. Louis were most satisfactory.

A member of the staff of the Imperial Institute was detailed

for special duty in St. Louis, and acted as Assistant Superintendent under the Officers of the Royal Commission.

A descriptive Catalogue of the Presents, prepared by Professor Dunstan, F.R.S., and Sir C. Purdon Clarke, C.V.O., C.I.E., F.S.A., and approved by His Majesty, was printed and issued by the Royal Commission.

The total attendance during the period of the Exhibition exceeded one million visits, and the number of Catalogues sold to visitors amounted to considerably over 13,000 copies. The Exhibit proved to be of the highest interest, and His Majesty's kindness in lending the Presents was greatly appreciated in America.

Arrangements for the return of the Exhibit were made by the Royal Commission, and the collection arrived at the Imperial Institute without any material damage.

WYNDHAM DUNSTAN.

REPORT OF THE COMMITTEE FOR EDUCATION AND SOCIAL ECONOMY.

BY F. G. OGILVIE, ESQ.

The arrangements for the exhibit illustrative of British Education were placed by the Royal Commission in the hands of the following Committee:—Mr. F. G. Ogilvie, Principal Assistant Secretary, Board of Education (Chairman); Mr. J. Struthers, C.B., Principal Assistant Secretary, now Secretary, Scotch Education Department; Mr. R. Blair, Assistant Secretary, Department of Agriculture and Technical Instruction, Dublin, now Principal Executive Officer, Education Committee, London County Council; Mr. S. J. Cartlidge, His Majesty's Chief Inspector for Schools of Art, and Dr. W. Somerville, Assistant Secretary, Board of Agriculture, London.

Having regard on the one hand to the very large field from which objects were available, and, on the other hand, to the strict limitations of the space allotted to the Section, the Committee felt that it would be only by proceeding on a carefully pre-arranged plan that they could hope to arrange for a display emphasising the resources, the variety and the traditions of education in the United Kingdom. They accordingly determined that they must make it their aim to restrict the selection of objects, as far as possible, to those indicative of the most representative features of British educational methods and results, and to avoid mere duplication of examples of types and systems. In the sub-division of the exhibit they were obliged to follow closely the classification laid down by the American administration at St. Louis; they found, however, that, without any departure from the prescribed sub-division, it was possible to prepare a scheme which would provide for a due and well-balanced representation of the educational machinery of England, Scotland and Ireland. Such a scheme they prepared in the form of an outline of a catalogue of the exhibit. It was clear that of almost every item very many institutions might well be regarded as typical exponents; and, in view of all the circumstances, the Committee decided that they must take the

responsibility of selecting certain institutions for invitation to co-operate with them in the exhibit. In making this selection they endeavoured to secure that every important type of educational institution should be represented, that to each of the leading sections of the exhibit England, Scotland and Ireland should each contribute, and that, as far as was consistent with this ideal, they should in the first instance apply to school and other authorities whom they believed to be in a position to provide most readily just the sort of examples which would be required to make the exhibit, as a whole, fairly representative of the educational activity of this country.

They appointed Mr. P. H. Atkin as their executive officer, to arrange for the actual preparation of the exhibit, and to be responsible, as their representative, for its installation and subsequent management at St. Louis. They then drew out detailed plans of the cases, frames, screens, etc., upon which the exhibit would be installed. They were thus able in their circular letter, inviting the co-operation of education authorities, to set forth not only the aims of the Committee but also suggestions for the guidance of contributors in making up their contributions, so that these might be at once fit for insertion in the section of the exhibit for which they were designed.

The Committee received most cordial support from the great majority of those to whom they applied, and all contributors subordinated the display of the work of individual institutions to the idea of combining to form an exhibit which should be in the best sense collective. It is to this public spirit of contributors that the success of the exhibit was due. Partly by correspondence and partly by the personal explanation which Mr. Atkin was able to give to individual contributors, so full a measure of co-operation was secured that the exhibit, when put together, afforded a very complete view of the work of educational institutions, without obscuring the organisation proper to any one of the important types which went to make the whole. The various contributors entered readily into the spirit of the Committee's request that prominence should be given to those objects only which illustrated characteristic methods and results, that the material required should be such as illustrated lines of work followed in the schools, rather than what might show the excellence attained by individual pupils. Actual duplication was avoided, but in every class separate

series of similar objects were accepted in illustration of the freedom and variety compatible with good educational results.

The Committee are pleased to record that, owing in large measure to the energy of their representative, the descriptive catalogue of the collection, complete and accurate, with all references, numbers and particulars as to screens and cases, was printed in London, and sent out to St. Louis in anticipation of the actual installation, and so was delivered in time for the opening of the Exhibition on 30th of April; indeed the British had the distinction of being the only non-American educational exhibit completely ready and catalogued on that day.

In the actual disposition of objects within the Educational Building order and neatness of display were aimed at. The grouping of the objects was by sections of educational work, and while the exhibit from each separate authority was carefully labelled with the detailed account of all the articles it contained, bold descriptions over each division marked out and identified the several sections of the entire collection. This made it easy for even casual visitors to gain a superficial knowledge of the exhibit, whilst the more serious student found in the official catalogue a helpful guide to a clear acquaintance with the details. A further aid to the study of the systems illustrated was provided by a pamphlet entitled "An Outline of Educational Organisation in the British Isles," which was specially prepared for the occasion, and plentifully distributed. Should the visitor desire to obtain fuller information, or to make special investigation with reference to any part of the collection, he had an opportunity of personal conference at the exhibit with the Committee's representative, and he had at his disposal in the reference cases sets of school prospectuses, University calendars, reports of Education Authorities, and a varied selection of programmes of study and time-tables of instruction, together with a useful selection of educational books for consultation.

The official catalogue of the exhibit gives in much detail a record of what was shown: it may, nevertheless, be of advantage to refer here to some of the leading features of the exhibit.

ELEMENTARY EDUCATION.

A thorough exhibition of the work done and the methods of teaching employed in the Elementary Schools of the United Kingdom was supplied by the educational authorities of certain

of the large cities—London, Glasgow, Leeds, Salford, etc. The London School Board, for instance, sent upwards of forty groups of examples; these included a series of albums, Government regulations and codes, syllabuses, schemes of work and timetables, together with specimens of completed work and photographs of all phases of education carried on under the Board, from the Infants' School, for children of three and four years of age, to the Higher Grade School, for children up to fifteen, and beyond the Day School for adult pupils in the Evening Continuation Classes. The School Board of Aberdeen and the Birmingham Education Committee sent plans and photographs of their latest Elementary Schools. One of the examples contributed by the latter authority showed a three-department Elementary School (boys, girls and infants) with accommodation for 1,070 children, all on one floor. The Liverpool Education Committee contributed illustrations of their system of peripatetic Science teaching, and gave examples of daily meteorological observations taken by pupils. The folio of Drawing exercises from Primary Schools of Burslem gave an example of preparatory training for children, arranged with a view to special local requirements. Voluntary Societies, so closely identified with the educational history of the 19th century, were represented by the British and Foreign Schools Society and the Kildare Place Society for the Education of the Poor in Ireland. The contributions from the National Union of Teachers testified to the great vitality in the United Kingdom of societies devoted to the interests of the teaching profession. The photographs sent by the training-ships "Warspite," "Arethusa" and "Chichester" proved of much interest to visitors. From many of the School Boards, as well as from these training-ships, there were sent sets of photographs illustrating schemes for Physical Training and for the teaching of Swimming.

SECONDARY EDUCATION.

This department of the exhibit included contributions from the great British public schools. The Committee felt that interest in these would centre no less upon the life than upon the work of the schools, and they were glad to be enabled to range together detailed exhibitions of all the activities of these schools of long standing and of world-wide reputation. Official publications of all kinds, portfolios of examination papers and

of work corrected, and specimens of average work from each particular class of school, afforded full opportunity for the appreciation of the sequence of studies followed and the standard of work attained in schools of this type; at the same time, "Annal and School Registers" indicated the history of the separate schools from their earliest years. In the case of Winchester College, specimens of the wooden trenchers characteristic of the school for 500 years formed a tangible link with the past. Complete series of photographs exhibited the present-day life and work of several of the schools, while Eton sent representations of the picturesque annual ceremonials which have been observed there on the 4th June since 1760. The records of Fettes College, Edinburgh, and of Edinburgh Academy showed how fully the methods of the English public schools have been applied in certain schools in Scotland. Other typical English schools represented were Christ's Hospital, Dulwich College, Parmiter's School, London, Bedale's School and Ripon Grammar School. Photographs and plans of buildings, schemes of work and portfolios of examination papers, school magazines, etc., exhibited the special features of typical Scottish secondary schools for boys, for girls, or for co-ordinated education of the sexes. Aberdeen Grammar School showed a series of photographs illustrating out-of-doors Nature study, while George Heriot's School, Edinburgh, gave, amongst other things, details of courses of practical work in physics and chemistry.

The Regulations of the Royal Naval College, Greenwich, of the Military College, Sandhurst, of the Military Academy at Woolwich, and of H.M.S. Worcester were included within this division. The Christian Brothers' College, Cork, afforded an example of the many schools established in Ireland by the Irish Christian Brothers, the main object of which is to afford free primary and secondary education to boys of the working classes.

Schools for the secondary education of girls were exemplified by the Alexandra College, Dublin, and by the schools of the Girls' Public Day School Company. The exhibit of Nature study work of the pupils of these latter schools, and a concise account of the Girls' Technical Department of Llandrindod Wells County School, Wales, attracted much interest.

HIGHER EDUCATION.

All the Universities of the United Kingdom and most of the University Colleges sent valuable contributions. Photographs of college buildings and of University life, calendars, gazettes, charts, students' handbooks, etc., all helped to instruct the inquirer as to the traditions, resources and development of these centres of learning. The collection from Oxford was notable for its display of photographs of college precincts and for several highly interesting histories and publications. Frequent reference was made by visitors to the University Calendar for information regarding the requirements for the Rhodes scholarships. Models of University hoods, caps and gowns were prominent features of the exhibit from Cambridge. The University of London was well represented by its constituent schools and colleges; the information concerning the curriculum of each was supplied in a series of charts, histories and prospectuses. A unique collection of archery medals was lent by the University of St. Andrews; this University is the oldest of the four in Scotland and these trophies of the students' archery club dated back to the year 1618. Included in the University of Glasgow exhibit were two calendars of dates 1826-7 and 1903-4: these effectively indicated the remarkable development of education, both in extent and complexity, which has taken place within this and similar Universities during the last century. Trinity College, Dublin, contributed photographs of the College buildings and other valuable histories, while the University of Wales and its three constituent University Colleges—Aberystwyth, Bangor and Cardiff—the Royal University of Ireland and the Queen's Colleges of Belfast and Galway sent descriptions of their fields of work and of the schemes which have been considered for further extension.

Among the most attractive and practical displays in the exhibit was that drawn from the following higher technical institutes, the various Polytechnic Institutions of London, the Municipal School of Technology at Manchester, the Glasgow and West of Scotland Technical College, the Camborne Mining School, the Wigan Mining and Technical College, the Leith Nautical College, and the Belfast Municipal Technical Institute.

The contributions from these and similar institutions were arranged so that each should indicate the nature of the work done in one particular branch of higher technical education. In this way there were illustrated: metal plate work, boot and shoe manufacture, engineering, electrical instrument making, optical work, printing, bookbinding, plumbing, lace making, weaving and dyeing, metal mining, coal mining, navigation, etc.

The display arranged by the Northamptonshire County Council, again, illustrated the provision made in their district for the instruction of those engaged in the manufacture of boots and shoes, which occupies so important a place in the economy of that county. This collection served to indicate the degree of specialization which is reached in the work of a local education authority that has to deal with an extended area in which a single industry is dominant.

Information with regard to the education of women was provided by the Bedford College, London, in the form of a "Calendar of Important Events affecting the Higher Education of Women, 1849-1903," and by papers supplied by Girton College, Cambridge, relating to the movement in 1887-8 and 1897 for granting degrees to women at Cambridge University. As further representative of colleges for women in the higher branches of education there were Newnham College, Cambridge, Lady Margaret Hall, Somerville College, St. Hugh's Hall and St. Hilda's Hall, Oxford, and the School of Medicine for Women, London.

SPECIAL EDUCATION IN FINE ARTS.

Examples in illustration of Special Education in the Fine Arts naturally bulked largely in the cases and on the screens. Conspicuous in this section of the exhibit were the reproductions of Art work forwarded by the Board of Education, South Kensington. The system of lending to Schools of Art and Design in the United Kingdom selected examples of work in every branch of Industrial Art has formed a notable and valuable feature of the aid afforded to Art education by the central authority in Britain. As far as practicable, original objects are lent, but in view of the limited number of originals and the large number of schools in need of them, recourse has been had to the reproduction of objects of every kind. Lantern slides for lecture purposes are also lent. The usefulness of

such an organised system appealed strongly to American and foreign visitors and the demonstration afforded by the collection shown was much appreciated; these objects served to illustrate not only the character of the loans but also the nature of the collections which the larger schools of Art in the United Kingdom are forming for themselves.

The Royal College of Art contributed photographs and selected works from its schools of architecture, painting and mural decoration, design, etching, and modelling. These formed a prominent feature of the section, and along with a collection of the works which gained the highest honours in the national competition between the schools of Art of the United Kingdom, and the important display from the Glasgow School of Art, gave an artistic finish to the whole exhibit.

The National Competition works shown numbered upwards of fifty, and were fine specimens of Art work, illustrating practically the whole range of study in schools of Art. New Cross School of Art exhibited a figure in the round from the living model, which was one of the most vigorous and accomplished of the objects shown; this figure has now been deposited in the St. Louis School of Fine Art. From Birmingham School of Art came some excellent designs for metal work. Liverpool School of Art was represented by varied and virile work in drawings and paintings from the life, designs for costumes, and modelled work both imitative and original. Refined work in design for woven fabrics came from Macclesfield, clever architectural designs from Scarborough, and dainty designs for a painted fan and sgraffito pottery from Plymouth. Prominent among the exhibits were some beautiful designs for pottery from Burslem, and tiles from Stoke-on-Trent. A delicately and truthfully drawn figure from the antique came from Hanley School of Art. Noteworthy original designs were also shown of printed muslin from Battersea, interior decoration from Chelsea, lace from Dublin, Cork and Taunton, architecture from Gloucester, and measured drawings of architecture from Winchester and Great Yarmouth Schools of Art. Among the imitative works were admirable studies of birds and insects from Camden School of Art, studies of dogs from Hull School of Art, plant form from Manchester School of Art, and oil painting of still life from Lincoln School of Art.

The set of Art and Nature study specimens forwarded from

Arbroath formed interesting examples of an important section of Art teaching. These studies illustrated the work executed by pupils of elementary and secondary schools, and of pupil teachers, industrial students and School Board teachers.

The Royal Academy of Music and Royal Military School of Music sent contributions, giving particulars of their work and methods.

SPECIAL EDUCATION IN AGRICULTURE.

A special feature in the exhibit was the demonstration of the work done in agricultural education. This consisted in the main of charts, maps, photographs and bulletins of the agricultural colleges. The College calendars gave details of the usual three years' course in agriculture, leading up to a degree (B.Sc.) or diploma in agriculture; they showed also the short external course of instruction given by the colleges in neighbouring districts to the farming community, and dealing with various agricultural subjects—forestry, veterinary science, dairying, poultry farming, bee-keeping and horticulture. The research and experimental work undertaken at the farms and demonstration plots attached to the colleges was strikingly displayed in the exhibit by means of diagrams and by pictures of students at work. Among the recent work more particularly illustrated there may be named: that in the Agricultural Department of the University of Cambridge on plant hybridisation; that in the Research Room at Leeds on the composition of milk as affected by nourishing cows with different feeding-stuffs; that at the Agricultural Colleges of Glasgow and Newcastle with regard to the effect of different kinds of manures on pastures, roots and cereals.

The organisation of one section of technical education in a county was illustrated by the show of the horticultural teaching carried out under the Essex Education Committee. This included plans of the school garden established at Chelmsford, syllabuses of the lectures in horticulture delivered throughout the county and of publications explaining experiments and demonstrations conducted in plots provided for the purpose.

SPECIAL EDUCATION OF DEFECTIVES.

The work done by public authorities in providing special facilities for the education of defectives was exemplified by collections of objects and photographs forwarded by the London

School Board and by the Education Committees for Bristol, Liverpool and Leeds, as well as by contributions from the British and Foreign Blind Society, the Royal Normal College for the Blind, the Society for the Oral Instruction of the Deaf, and other kindred organisations.

PHYSICAL EDUCATION.

The examples procured for the purpose of indicating the formal and informal methods of promoting physical culture which obtain in educational institutions of all grades in the United Kingdom, were exhibited, each in connection with the other work of the institution to which it belonged; in view, however, of the importance which in the eyes of many visitors to the Exhibition attached to this department of education in the United Kingdom, it may be convenient to quote here a notice of this aspect of the exhibit from one of the leading journals in the United States devoted to physical education. After complimenting the Royal Commission on the completeness of the exhibit as a whole and the system of its arrangements, the writer goes on to say:—"The primary school exhibit is especially complete, showing work from London, Leeds, etc. In London each school has its instructor; the younger children work in the room or in the playground, while the elder children have a gymnasium A large bound volume of photographs, 'Girls' Physical Exercises,' shows most completely the work of girls. The photographs are preceded by an outline showing the work to be based upon the Swedish system. An equally complete volume by outlines and photographs shows work for boys. It includes illustrations of how to sit, stand, write, read and swim (preliminary exercises for swimming are taught standing and lying on the floor), life-saving drill, restoring the apparently drowned, and games. Leeds has ten baths and eleven instructors, and the lessons are given from April 20th to September 21st. Here also are plenty of statistics and outlines of work. Liverpool adds photographs indicating Saturday afternoon rambles: the work in several schools is also shown. There is through England no uniform course of study, each city outlining its own, but a Committee recently appointed for the purpose of suggesting such a uniform course has just completed its report. Among secondary schools for boys, Eton shows military work, tests in swimming, a meet,

various games, and a great amount of attention is shown by many of the large schools situated on a river to rowing. Rugby shows baths, cadet corps and a photograph of each athletic costume worn at the schools. Secondary schools for girls are also shown, with lacrosse, and cricket played in gloves and shin-guards, hockey in gymnasium costume, rowing and gymnasium work. At the universities gymnastic and athletic work is not compulsory, each man being so 'keen' for this training that restraint instead is necessary. Framed photographs show a Durham four-oared boat, and football costume quite different from the padded American armour—there are thick boots, but only short knickerbockers. Other photographs show, from the women's affiliated colleges at Oxford, hockey, tennis and rowing."

BOOKS OF REFERENCE, ETC.

The books available for consultation at the exhibit, to which reference has already been made, included a set of the Acts of Parliament concerning education in the United Kingdom, the various sets of regulations for the administration of these Acts issued by the Board of Education, Scotch Education Department, and the three Departmental Boards for Ireland, namely, the Commissioners of National Education, the Department of Agriculture and Technical Instruction and the Intermediate Education Board. The collection included also official reports, annual returns, specimen courses, representative educational journals, periodicals, etc., contributed by publishers and by scientific societies and educational associations, college calendars and school prospectuses; and it was completed by a general map of the British Empire and maps showing the distribution of Universities and training colleges, technical institutions, schools of Art and secondary schools throughout Great Britain and Ireland.

AWARDS.

In view of the method they had felt constrained to adopt in the selection of institutions for representation in the exhibit, and of the restrictions which, in the common interest, they had imposed upon contributing institutions, the Committee advised the Royal Commission that no part of the British education exhibit ought to be regarded as competing for an award at the hands of the Jury. The Committee learn with pleasure that, although the Commission gave effect to this desire, the Inter-

national Jury, having visited the exhibit, have requested to be permitted to indicate their appreciation of its value and interest by awarding to each of the eight groups into which in the official classification the exhibit is divided, a Grand Prize—the highest honour it was in their power to give. This official mark of approval, with the expressions of satisfaction recorded by many distinguished visitors of eminence in the educational world, marks the exhibit as, in the best and fullest sense, a collective one.

DISPOSAL OF EXHIBITS.

During the course of the Exhibition the Committee received several inquiries from Universities, State Boards of Education, Councils of High Schools, etc., as to whether it would be possible for them to obtain at the close of the exhibit, for their own educational museums as permanent additions to their collections, certain of the photographs, volumes, examples, etc., comprised in the section. In view of these requests, they addressed to the contributors a circular letter of inquiry as to their wishes in the matter. The response to this was most cordial, but the Committee very much regretted that, as unexpected difficulties of considerable complexity arose in the attempt to conform to the rules of the United States Customs Department regulating such cases, it was found impossible to take advantage of the willingness of many of the contributors to present their exhibits to American institutions. For this reason the Committee returned the material which contributors had been good enough to place at their disposal, but in returning it they made the suggestion that it might be possible and convenient for contributors to preserve for any similar future occasion such part of the exhibit as could not be replaced without considerable trouble. From many of the contributors they have received warm acknowledgments for this suggestion.

Being, however, in the unique position of having in the exhibit contributions from all British Universities, the Committee were unwilling to disperse this valuable collection; they therefore suggested to the Universities that their contributions might be deposited in the Science Library of the Victoria and Albert Museum, South Kensington, for reference by the public. With certain small reservations of individual articles, the Universities have accepted this proposal, and there is now in

that library a valuable index to the many sides of British University life.

The pamphlet on British Education, which was prepared by the Committee and distributed gratis to all visitors who appeared to have a real interest in education, formed with the Catalogue a compact record of the exhibit which was sufficient for general purposes, and the Committee desire to give their warm acknowledgments to those who supplied them with special printed matter dealing with any of the many phases of educational activity. These sheets and pamphlets formed a valuable addition to the means of affording information which the Committee had at their disposal, and all of them found ready and grateful recipients. At the close of the Exhibition the show-cases, which had been constructed in America, were sold to the University of Missouri, and will there be used for educational purposes. Particulars as to the net cost of the exhibit as a whole are given below (p. 69).

SOCIAL ECONOMY.

The exhibit of Social Economy, for which only a limited space was available, was organised by the Education Committee. With so wide a field to choose from, and a small space for installation at St. Louis, the Committee were bound to restrict their exhibits to very few subjects; and while limiting the range of social activity which was to be illustrated, they followed in the preparation of this exhibit the same method as they adopted in the case of the Education exhibit.

The most prominent features of the display were those contributed by the Board of Trade and by the Right Honourable Charles Booth. The Board of Trade prepared a series of 28 beautifully drawn charts illustrating the statistics up to 1903 of the United Kingdom relating to the distribution according to occupation of the industrial population; fluctuations in unemployment; wages and prices; consumption of articles of food and drink; pauperism; foreign trade; the production or consumption of certain raw materials and manufactures; trade disputes causing stoppage of work; trade unions; co-operative societies and fatal industrial accidents. The cost of preparation of these charts was borne by the Royal Commission; they were reproduced in pamphlet form and widely distributed at St. Louis, and the interest they have caused has been so great that

a folio edition of reproductions in colour was subsequently published by H.M. Stationery Office. Mr. Charles Booth's map of London, 25 inches to the mile and covering about 400 square feet of canvas, illustrating by various colours the social condition of the inhabitants of each street, and showing other features, caused much marvel, especially among American real estate agents; 10,000 leaflets explaining Mr. Booth's plan of work and the contents of his volumes (copies of which were exhibited) were given away to the visitors. The Post Office Savings Bank illustrated by an exceedingly artistic diagram the growth of their system since its inception in 1861; the Metropolitan Asylums Board's charts relating to infectious diseases in London, and comparing the death-rate there with that in certain foreign cities (including St. Louis), were closely studied; the Belfast Corporation and the Guinness Trust provided some excellent material dealing with the housing of the working classes, and on this subject the London County Council and the Corporations of Edinburgh and Glasgow contributed very useful reports. The Scottish Home Industries Association sent examples of their Harris and Shetland tweeds and a portfolio of their reports, scheme of work, etc. The Chief Inspector of Reformatory and Industrial Schools contributed a remarkable collection of photographs illustrating every phase of the system which he administers, a series of statistical diagrams giving much important information, and a specially prepared monograph of the system and results—copies of which were presented to visitors who showed genuine interest in the subject. The Garden City Association sent pictures of their Hertfordshire estate and also collections of photographs with very full descriptions from Port Sunlight and Bournville; copies of several papers dealing with their operations were distributed. Toynbee Hall produced some photographs and several volumes of reports and printed matter illustrating the working of their lectures, classes, debates, concerts, etc., and a specially interesting schedule of work carried on by the residents. The Local Government Board supplied the complete census returns for 1901 and other volumes. The London County Council sent a selection of their reports and publications dealing with municipal improvements and public health. The Corporation of Liverpool contributed a costly volume showing the work they have done, while the Corporation of Manchester presented a com-

plete set of their Manchester municipal code. The Charity Organisation Society forwarded an exhaustive collection of books, reports and pamphlets dealing with their work, while contributions from the Home Office, the Agricultural Organisation Societies in London and Dublin, the Registrar of Friendly Societies, the Congested Districts Boards of Scotland and Ireland, the Invalid Children's Aid Association, the Lunacy Commission, and the Cambridge University Press did much to make the section successful.

Although, as in the case of the Education exhibit, this exhibit was excluded from competition, the International Jury nevertheless indicated their appreciation of the value and interest of the section by awarding it a Grand Prize, the highest honour it was in their power to give.

The Committee have the gratification of recording that the Exhibition authorities, on the recommendation of the Jury on Social Economy, have offered for the gracious acceptance of His Majesty the King a special Commemorative Diploma testifying to their admiration of His Majesty's interest in the housing of the working classes in the United Kingdom. They are also glad to record that Commemorative Diplomas were awarded to His Excellency the Earl Grey, G.C.M.G., for his lordship's successful promotion of the work of temperance reform; to Lord Iveagh, K.P., for his lordship's work in connection with improved dwellings for the working classes; and to the Right Honourable Charles Booth, D.C.L., for his researches and publications concerning the life and labours of the people of London.

To make this section more complete a selection of some 70 journals and periodicals published in the United Kingdom on social economics were included in the exhibit.

One division of the Social Economy section was the very unpretentious but by no means unimportant exhibit of the British finger print system of identification of criminals prepared by the Scotland Yard authorities. The practical result of this exhibit has been immediate and marked. Only three framed pictures, a few printed forms, and a small box of the simplest apparatus were comprised in this display. But the high state of the efficiency of the system and the simplicity whereby imperceptible imprints of fingers on glasses, newspapers, tables, etc., were at once brought into bold prominence and

identified, almost made visitors regard it as uncanny. The constant demands upon the patience and explanatory powers of Detective-Sergeant John Kenneth Ferrier, of Scotland Yard, who was attached to the exhibit, were never made in vain. During the course of the Exhibition a large number of chiefs of police and wardens of penitentiaries made themselves acquainted through him with Mr. Henry's system of indexing, while over 400 inquiries were made by post. There is much satisfaction in recording that so far the police departments of 59 cities of the United States have formally expressed their intention of adopting the British system. Steps are being taken to establish central bureaux for finger impressions of prisoners. The Committee have much pleasure in recording that a Commemorative Diploma was awarded by the Exhibition authorities to Detective-Sergeant Ferrier for his services.

A large number of smaller exhibits were specially asked for by Harvard University for their Department of the Ethics of Social Questions, and by the Chicago Municipal Museum, and as far as it was possible to obtain the necessary permission from the owners the Committee have very cordially complied with these requests; a considerable part of their collection has, therefore, been sent to Harvard and Chicago.

STATISTICAL AND GENERAL.

The space allotted for the Educational Exhibit was 6,500 square feet, that for the Social Economy Exhibit 810 square feet. There were 111 separate contributors to the Educational Exhibit and 31 to that for Social Economy.

In the General Finance Statement at page 43 will be found a table showing the expenditure by the Committee, arranged in the form adopted for the accounts of all the Committees of the Royal Commission. But the Education Committee are of opinion that it may be of use for future reference to show the following special distribution of the expenditure through the Committee in connection with the two exhibits. In this statement the various items are grouped so as to indicate, as accurately as possible, the incidence of outlay under categories proper to the preparation of an exhibit on the lines described in the report.

The expenditure for which the Committee was responsible included, as will be seen, that for the flooring of the spaces

allocated to the exhibits in the Exhibition as well as that for the fitting up of partitions, the provision of all Exhibition cases and screens and of furnishing generally.

The cost of erecting the façade, being part of the general expenses under the direct control of the Executive Committee, is not included in the statement given here.

	Education.	Social Economy.
	£	£
1. Preparation of material for the exhibit supplied by contributors; collection and redistribution of contributions; packing (net cost)	243	203
2. Exhibition cases, screens and fitting up in Exhibition building, including flooring (net cost)	1,090	152
3. Freight	147	12
4. Insurance	104	13
5. Salaries and wages (including guards at St. Louis) *	961	106
6. Travelling expenses and subsistence *	948	105
7. Stationery, printing and petty disbursements *	52	6
	3,545	597

* In the case of these services the total expenditure, which was common to the two exhibits, has been allocated between them as nearly as possible in proportion to the work and charges they involved.

The Committee anticipated that they would have to incur considerable expense in the actual preparation of objects for the exhibits, and while this was the case in connection with the small and specialized Social Economy Exhibit, it did not hold in the larger and more general Educational Exhibit. For it they were able to arrange that the individual contributors worked to a general scheme and prepared their contributions in forms and sizes fixed for the whole exhibit. This, however, would not have been possible if the Committee had not had early at their disposal the services of an energetic representative familiar with educational matters and of wide experience in dealing with School Authorities. Indeed they cannot speak too highly of Mr. P. H. Atkin's work, whether in the organisation and preparation of the exhibit, or in its installation and superintendence in St. Louis; from many visitors to the exhibit they have learned with great pleasure that his knowledge and his courtesy made the wealth of material there most

fully accessible to all who came to see or to study. It is also mainly to his care at every point that they owe the complete satisfaction with which contributors have referred to the return of their several contributions.

Mr. Atkin was well supported in his work, first by Mr. A. E. Banham and later by Mr. C. E. Down, who successively assisted him in the general work of the exhibit. Mr. J. H. Cundall made the detail drawings for the Exhibition cases required and supervised their construction by the contractors in America. The arrangements for transport of the material from England to St. Louis and back also fell to him, and the Committee record with pleasure that these were so well carried out that on each occasion they went right through without delay.

F. G. OGILVIE,
Chairman of the Committee.

REPORT OF THE ART COMMITTEE.

BY SIR EDWARD J. POYNTER, BART., P.R.A., H.R.S.A.

IN his Presidential speech at the first meeting of the Royal Commission at Marlborough House on the 28th April, 1903, His Royal Highness the Prince of Wales stated that it was particularly desired that Great Britain should be worthily represented in the Fine Art Section at the St. Louis Exhibition, a hope which His Royal Highness had no doubt would be fulfilled. In alluding to this wish at the Royal Academy Banquet on the 29th April last, I was enabled to state that, under His Royal Highness's name and Presidency, the Fine Art Committee were able to make a more authoritative appeal in collecting works than would otherwise have been possible, and a notable success was thus secured in the Fine Art Section, which by common consent has amply fulfilled the wish of His Royal Highness.

The Royal Academy was invited by the Royal Commission to form a Committee, for the organisation of the Exhibition. A small Committee of Members of the Academy was first formed and held two meetings to consider the composition of the Fine Art Committee, and to learn from Mr. Halsey Ives, the Chief of the Department of Art, who was at that time in England, what arrangements could be made for space. We found that all the most important sites had already been allotted, and we had to take what was left. This point is further dealt with under the section devoted to "Space," p. 73.

CONSTITUTION OF COMMITTEE.

The Fine Art Committee of the Royal Commission consisted of:—

- Sir Edward J. Poynter, Bart., President of the Royal Academy, H.R.S.A., Chairman.
- Edwin Abbey, Esq., R.A.
- Sir Lawrence Alma-Tadema, O.M., R.A., H.R.S.A.
- Sir Wyke Bayliss, President of the Royal Society of British Artists.

- Francis Bate, Esq., Hon. Secretary, New English Art Club.
 Thomas Brock, Esq., R.A.
 Walter Crane, Esq., R.W.S., President of the Arts and Crafts Exhibition Society.
 Frank Dicksee, Esq., R.A.
 Sir Thomas Drew, President of the Royal Hibernian Academy.
 Fred. A. Eaton, Esq. (Secretary, Royal Academy), Honorary Secretary.
 E. J. Gregory, Esq., R.A., President of the Royal Institute of Painters in Water Colours.
 Sir F. Seymour Haden, President of the Royal Society of Painter-Etchers.
 T. G. Jackson, Esq., R.A.
 J. MacWhirter, Esq., R.A., H.R.S.A.
 W. Q. Orchardson, Esq., R.A., H.R.S.A.
 Val C. Prinsep, Esq., R.A.†
 Frank Short, Esq., R.E.
 Sir Isidore Spielmann, F.S.A., Honorary Secretary.
 Frank Walton, Esq., R.I., President of the Society of Oil Painters.
 Sir A. E. Waterlow, R.A., President of the Royal Water Colour Society.
 Aston Webb, Esq., R.A., President of the Royal Institute of British Architects.

A sub-Committee for Original Objects of Art Workmanship consisted of :—

- Walter Crane, Esq., R.W.S., President of the Arts and Crafts Exhibition Society, Chairman.
 W. A. S. Benson, Esq.
 Walter Cave, Esq.
 George Frampton, Esq., R.A.
 Edward S. Prior, Esq. (Honorary Secretary).
 Halsey R. Ricardo, Esq.
 C. F. A. Voysey, Esq.
 Emery Walker, Esq.

Mr. Reginald Hunt was appointed assistant to the Honorary Secretaries and Resident Representative of the Fine Art Com-

† Deceased.

mittee at St. Louis, and Mr. Alfred A. Longden Representative of the Applied Art sub-Committee.

CLASSIFICATION OF SECTION.

The following classification of exhibits came within the scope of the Committee :—

Group 9.—Paintings and Drawings.

Group 10.—Engravings and Lithographs.

Group 11.—Sculpture.

Group 12.—Architecture.

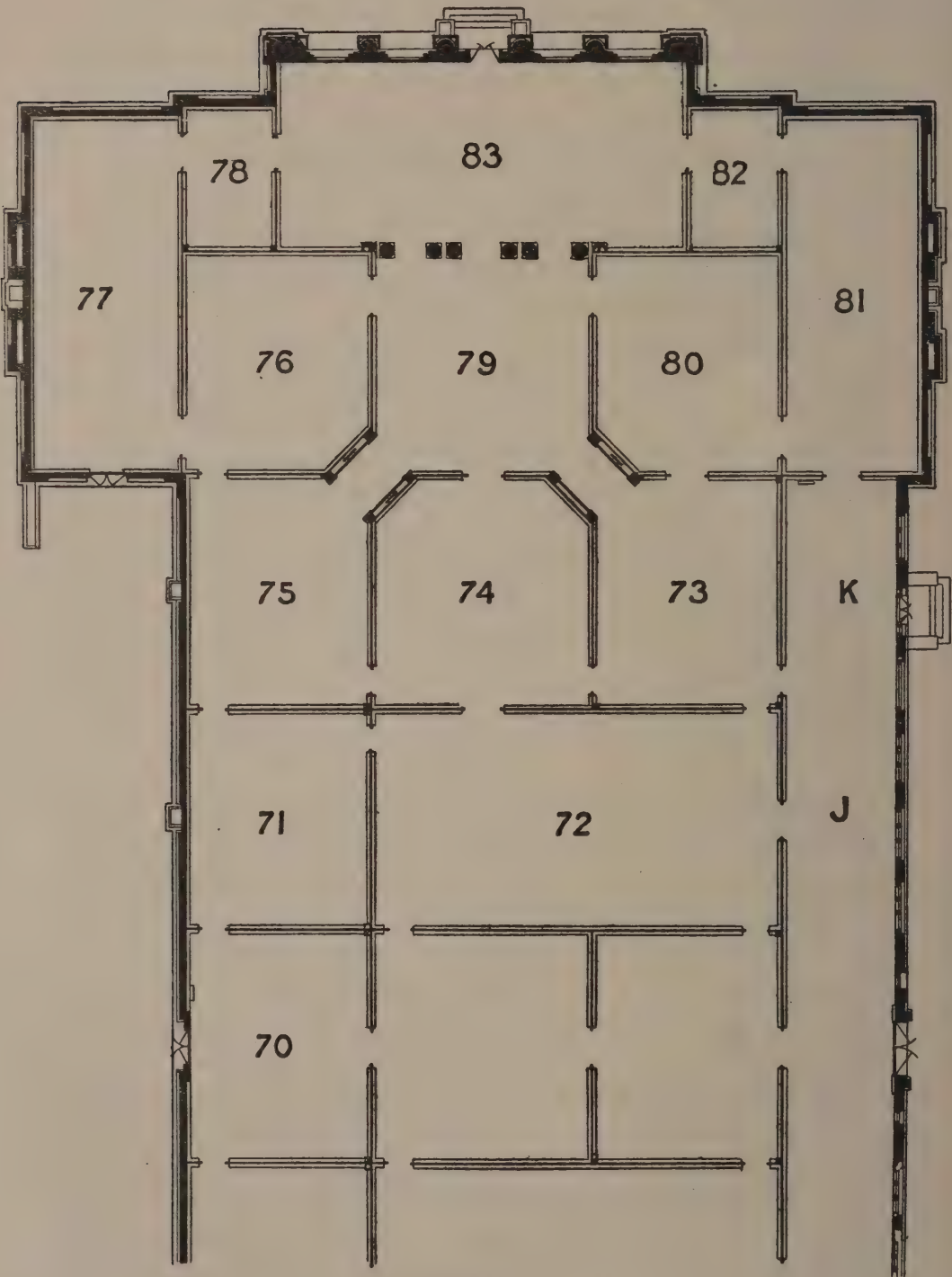
Group 14.—Original Objects of Art Workmanship (Arts and Crafts).

In the constitution of the Committee every effort was made to safeguard the many and varied interests of Art, and to secure representation to all effective schools and groups of painters.

For the first time in the history of international exhibitions original objects of Art workmanship were shown on a large scale side by side with the Fine Arts; that is to say, that the hard and fast line which has hitherto separated Applied Art from the Fine Arts was obliterated, and under the broader classification the same tests of conception and technique were applied, whether the work was on canvas or in marble, or in plaster, wood, metal, glass, or textiles.

SPACE.

Although equipped with a strong organising committee, the British Section was from the outset handicapped by the inadequacy of the space allotted to it, and by its inferior situation as compared with the sites obtained by other countries. On the whole the space at the disposal of the Art sections of the United States and the twenty-three foreign countries participating was much larger than at any previous Exhibition. The actual area of all the galleries was said to be nine acres and the cost of the four Art Palaces about a quarter of a million sterling. To Germany was accorded the best position in the left wing and to France a similar position in the right wing, both having a larger amount of space than was allotted to Great Britain. The space finally allotted to Great Britain, including that gained by blocking various doorways, amounted to 1,455 lineal feet in the Fine Art Section and 269 feet in the Applied Art Section. The floor space in the former was 17,760 square



Scale.
0 5 10 20 30 40 50 FEET.

feet and in the latter 3,110 square feet. A strong effort was made by the Chairman to secure two additional rooms, but with only partial success, although it was understood that these had originally been promised to us.

To reach the British Art Section from the Grand Entrance at the north side it was necessary to pass through the German and Dutch galleries. We laboured, too, under the disadvantage of being unable to reach our galleries on the south side, as, owing to their being a considerable height above the ground-level, they were for some time inaccessible to the public. The Chairman, with the assistance of our Commissioner-General, made strong representations to the Exhibition Authorities in regard to this drawback, and eventually succeeded in inducing them to construct a flight of steps from the lower level to our terrace.

On the west our section was entered by one doorway leading from the gardens into galleries J and K.

It is important that public attention should be drawn to the primary cause of the difficulties with which the Committee had to contend in these respects, more especially as they do not now arise for the first time. Great Britain is invited to participate in foreign international exhibitions at the same time as other countries, but, unlike other countries, we have no permanent and special department by which such enterprises can be organised. In France and in Germany there exist permanent Government Departments which are always ready at short notice to begin the work associated with their participation in international exhibitions. It is not so with Great Britain. Here, upon the receipt by the Foreign Office of an invitation to take part in an international exhibition, that department confers with others—with the Treasury, which furnishes the funds that may be necessary, with the Board of Trade, and, in the event of a Royal Commission being appointed, with the Home Office also. After the considerable delay which these negotiations occasion influential gentlemen, renowned in politics, commerce, literature, science, and art, are invited to join the Commission. The time occupied by these preliminary arrangements results in Great Britain getting to work considerably later than either France or Germany, who usually have a start of us by many months, during which time they have sent representatives to visit the site of the exhibition, and to see the officials of the exhibition administration, and have, in all

probability, secured the best positions as regards spaces in all the sections. When Great Britain is ready to move we find to our cost that we have to take the spaces in various sections which France and Germany, and perhaps other countries also, have refused to accept, or, at least, have left for us to take.

The time thus lost not only places us at a disadvantage in regard to the acquisition of suitable space, but also reacts detrimentally on the whole work of organisation. Seeing that the Art Committee cannot be set to work until its constitution is settled, and the amount of its grant determined by the Executive Committee, the time left in which to organise a display creditable to the nation is much too scanty, and the Committee has consequently to work at a pressure which often threatens to impair its efficiency.

MEETINGS.

The Committee held twenty-three meetings, at which they considered the selection of exhibits. In many cases these meetings were protracted to nearly four hours. The arrangements respecting insurance, collection, packing and transport, and decoration of the rooms, were all matters which were carefully considered by the Committee.

REGULATIONS.

The works eligible for exhibition had, by the rules of the authorities, to be executed subsequent to 1893, the year of the Chicago Exhibition, and this regulation was adhered to.

A regulation which affected Great Britain was that which excluded artists of American nationality or extraction from exhibiting with us, although their homes are in England, and their work produced here and identified with British Art Schools. Many of these artists sent their work to the American Section, and the British Section was the poorer by such names as John S. Sargent, R.A., E. A. Abbey, R.A., the late G. H. Boughton, R.A., J. J. Shannon, A.R.A., George Wetherbee, R.I., J. McClure Hamilton, Daniel Wehrschmidt, Mark Fisher, F. Derwent Wood, W. J. Hennessy, F. D. Millet, etc.

SELECTION OF WORKS OF ART.

The main object which the Committee kept before it in its work of selection was that the British School in its various

branches should be presented at its best, and by the most representative art that could possibly be procured. To this end a searching selection was made both in regard to the artists contributing and the works eventually exhibited.

With this object a new departure was tried. The Committee adopted as a principle that instead of inviting artists to participate, a selection should be made from the best works produced during the last ten years in oil or water-colour painting, sculpture, architecture, etchings, and engravings. No better rule could have been devised to obtain the aims of the Committee, and, although it was found difficult to accomplish, it was adhered to. It involved visits to all the exhibitions held during the year, and a careful examination of the catalogues of every exhibition held during the last ten years.

In other respects the precedents of the Royal Commission for the Paris International Exhibition of 1900 were followed. It was determined (1) that artists' claims to representation should be based upon their past work and reputations; (2) that no Art Society should be invited to co-operate as a body, and that "all works would be invited and accepted as the works of individuals, and not as representing any institution"; (3) that all exhibits should be comprised under the head of "Great Britain and Ireland"; and (4) that, as the space at international exhibitions is almost invariably restricted, such exhibitions cannot be regarded as suitable occasions on which the younger artists can reasonably expect to make their professional début.

Besides the works specially invited in accordance with the system of selection already described, many others were chosen by the full Committee from a large number submitted to them.

INVITATIONS TO OWNERS.

Invitations to owners to exhibit were issued, intimating that we had been authorised by H.R.H. the President of the Royal Commission to appeal for the loan of certain works in their possession, stating at the same time that an important international object would be served by their kind co-operation.

RESPONSE.

Thanks to the willingness of artists and private owners to place their works at the disposal of the organising Committee, the collection ultimately secured was most satisfactory, both in

the number of works exhibited and their exceptional merit. As compared with previous exhibitions, the results in regard to numbers are set forth in the accompanying table:—

TABLE I.—SHOWING NUMBER OF BRITISH WORKS OF ART AT THE LAST FIVE INTERNATIONAL EXHIBITIONS.

	Oils.	Water Colours.	Pieces of Sculpture.	Black and White Drawings.	Architectural Drawings.	Total.	Artists Re-presented.	Works per Exhibitor.
Paris, 1889	172	124	40	123	93	552	300	1·84
Chicago, 1893	461	204	53	266	146	1,130	515	2·19
Brussels, 1897	205	109	24	222	54	614	259	2·33
Paris, 1900	166	89	54	114	47	470	282	1·67
St. Louis, 1904	293	158	90	294	190	1,025	554	1·85

It will be seen that we contributed to the St. Louis Exhibition nearly 300 oil paintings, about 150 water-colour drawings, 90 pieces of sculpture, nearly 300 engravings, etchings and drawings, and nearly 200 architectural drawings. In all we exhibited 1,025 works, representing 550 artists and architects.

TABLE II.—COMPARATIVE TABLE SHOWING NUMBER OF BRITISH AND FOREIGN WORKS OF ART AT THE ST. LOUIS EXHIBITION.

Country.	Group 9.	Group 10.	Group 11.	Group 12.		Group 14.
	Oils and Water Colours.	Engravings, Etchings.	Sculpture Exhibits.	Architectural Drawings.	TOTAL. Fine Arts.	Arts and Crafts Exhibits.
United States	1,619	337	354	289	2,599	945
France	661	318	308	48	1,335	220
Great Britain	560	185	90	190	1,025	420
Germany	330	72	124	63	589	70
Russia	533	4	14	...	551	39
Holland	242	132	28	24	426	65
Italy	243	11	102	4	360	13
Austria	226	23	51	13	313	190
Belgium	218	9	55	8	290	...
Sweden	118	4	45	...	167	...

The sub-Committee for Applied Art, under the presidency of Mr. Walter Crane, R.W.S., were given a free hand in the selection of their exhibits. The United States exhibited nearly 1,000 original objects of art workmanship. Great Britain came next with over 400, the largest collection of its kind we have

ever contributed to any exhibition. France followed with over 200 objects, and the other countries were proportionately well represented. The display included book-bindings, pottery, glass, jewellery, enamel. (See Report of the Chairman of the sub-Committee for Applied Art, page 88.)

As compared with foreign countries, Great Britain was only distanced in the number of works by the United States and France. The comparative statistics of British and Foreign art exhibits as published by the Official Catalogue Company are shown in Table II.

COLLECTION, PACKING AND TRANSPORT.

Messrs. Arthur Dicksee and Company were appointed agents to collect and pack the works for the Fine Art and the Applied Art Sections, and performed their duties in a highly satisfactory manner. A special officer was employed to accompany each consignment so as to ensure proper care in handling the cases, and thereby diminishing the risk of breakage or injury to pictures, etc.

The pictures were packed in zinc-lined cases, and special men were sent to St. Louis to unpack them, as well as to re-pack and solder the cases upon the close of the Exhibition.

The transport of the Art consignments, undertaken by Messrs. Henry Johnson and Sons, occasioned the Art Committee considerable anxiety; the cost of the transport on the homeward journey was even greater than that of the outward journey, and constituted an unexpected and additional expense to the Commission.

The severity of the weather, the difficulty in obtaining trucks, the dearth of rolling-stock, and the congestion of the traffic all contributed to delay the return of exhibits.

The Committee are indebted to Mr. J. H. Cundall for the special assistance which he kindly gave to matters relating to transportation, which resulted in the earlier return of the pictures, etc., than would otherwise have been the case.

CUSTOMS.

The great difficulties resulting from the stringent nature of the regulations of the United States Government in regard to works of art and industry from foreign countries are fully dealt with in a separate report by Sir C. M. Watson. It may, however, be mentioned in this connection that

before the packing of our works of art could be commenced no less than ten separate forms, containing miscellaneous information, had to be examined and approved in various departments of the U.S. Customs House!

It is, however, satisfactory to note that, in the face of very exceptional obstacles, Great Britain was the first to complete the dismantling of her Art Section, and it was well on its way to New York before permission had been obtained by some of the other foreign art departments to begin the work of packing.

The personal good-will, in difficulties which were often acute, of the Chief of Customs of the Port of St. Louis, the Deputy Surveyor, and the representatives of the Treasury Department of Washington, and their desire whenever it was possible to interpret the law in a liberal spirit, somewhat facilitated our task.

Our thanks are also due to the Board of Customs in London, who, at the request of our Honorary Secretary, assisted us by rapidly passing our cases through their department.

DECORATION OF ROOMS.

In the decoration of the British Section a deep crimson and cream white scheme of colouring was adopted, which by its brightness contrasted pleasantly with the neighbouring galleries, in which the colouring was uniformly subdued. The walls of the Fine Art galleries were hung with a silky red burlap; those in which the Applied Art exhibits were housed, with a biscuit-coloured burlap. Dados and doorways were painted white, and the floors were covered with linoleum of a neutral green shade. A handsome frieze was designed, and for the most part painted for us, by Mr. Walter Crane, President of the Arts and Crafts Exhibition Society, and a member of the Art Committee. The scheme consisted of a series of shields connected by scrolls of foliage and bearing inscriptions relating to the contents of the several galleries. Those in the Applied Art Section were appropriate to the aims of the Arts and Crafts movement, and referred to the unity of design and handicraft, in adaptation, material and use. About a dozen shields, including the Royal Shield and that of H.R.H. the Prince of Wales, President of the Royal Commission, appeared in the frieze panels, connected with a design of decorated foliage.

With the exception of Galleries K and J, containing the

architectural drawings, the whole Section was lighted from above, the light being diffused by means of a velarium of unbleached muslin.

INSTALLATION.

The installation of the Section and the preparation of the catalogue involved a great deal of thoughtful work, but their successful accomplishment compensated for all the labour expended on them. The catalogue, compiled by Sir Isidore Spielmann, Hon. Sec., more than fulfilled its purpose as a guide to the visitors, inasmuch as, besides a copious explanatory list of all the exhibits in both the Fine Art and Applied Art Sections, it contained a useful "Who's Who" of over 550 eminent British artists and architects. Each work had a label affixed, bearing the catalogue number, the name of the artist and the title of the subject.

OPENING.

On the day of the official opening of the Exhibition, April 30th, 1904, the efficiency of our organisation was triumphantly attested by the fact that our Art Section was ready to receive visitors, complete in every detail. This was the more noteworthy since the galleries of our neighbours, including those of our host—the United States—were unfinished, and, consequently, still closed to the public. Our catalogue was the only one on sale to the public on the opening day, and for a considerable time afterwards none other was obtainable in the Art Palace. Even the American catalogue did not appear until late in June. A similar state of affairs prevailed in all the other sections of the Exhibition, where for many weeks the British Industrial Catalogue stood alone. Our satisfaction at this achievement is enhanced by the recollection that the same punctuality was displayed by the British Art Sections at Brussels in 1897 and at Paris in 1900. It is to be feared that our readiness on the opening day, however, was not adequately appreciated by the public, owing to the disadvantage under which we laboured in the matter of direct accessibility, to which reference has already been made in this Report. Only a small percentage of the public filtered through the unfinished German and Dutch Sections into our galleries, while crowds flocked into the French Section in the other wing, notwithstanding that it was only partially available for public inspection.

ARRANGEMENT OF WORKS.

Oil Paintings.

The hanging of the pictures, drawings, etc., and the placing of the sculpture were kindly undertaken by Mr. E. J. Gregory, R.A., P.R.I., and Mr. Alfred Parsons, A.R.A. It has already been pointed out that the space allotted to Great Britain and Ireland was insufficient, and, consequently, some economy had to be practised in the hanging. A considerable accession of wall-space was obtained by closing some of the doorways, which were found to be unnecessarily numerous. Even then, however, the pictures had to be hung more closely than was altogether desirable. Nevertheless, with few exceptions, we were able to show, with equal advantage, the pictures of all schools of British Art, and of every class; at least one work of each artist represented was placed on the line.

In the matter of oil paintings and water-colour drawings, it was found possible to leave a very narrow space between each, and in hardly any case did it become necessary to hang more than two lines of pictures. In short, every picture accepted by the Committee was placed in a position where it could be well seen.

Drawings, Etchings, Engravings.

The first room approached from the German Section was No. 70 (see plan), which was devoted exclusively to the black and white work of ninety eminent artists: drawings in pen, pencil, and chalk, etchings and engravings—too many, perhaps, to show to advantage in the limited space; but we were anxious to have the collection as complete as possible, and few, if any, of our most important men were absent. Not only were our etchings both good and representative, but we had no reason to be ashamed of the examples of our characteristically English art of mezzotint displayed.

Water Colours.

Room 81 was devoted exclusively to water-colours. Messrs. Gregory and Parsons considered that this room was not large enough for the very representative collection sent over, and they therefore had to utilise three walls in Room 80, reserving the fourth wall for pastels and small oil paintings. The water-

colours, as our National Art, proved especially attractive to visitors.

Architecture.

Architecture filled Galleries J and K. Here seventy of our leading architects were represented by two hundred works. Few men of eminence in the profession were unrepresented, and the great advance made of late in British architecture was amply illustrated by the carefully selected works appearing in our section.

Sculpture.

The collection of sculpture consisted of works in marble and bronze only; plaster casts were not sent owing to the great risk of breakage. Although small, our collection was eminently representative, only one or two eminent sculptors being absent. A considerable number of busts and groups were disposed round the walls of Gallery 79, where they showed to great advantage, and some of the smaller bronzes were grouped upon pedestals in Galleries 72 and 81, adding largely to the general effect. A few bas-reliefs found good positions in the short passages leading from Gallery 79 to Galleries 73 and 75, which were well lighted from the side.

Applied Art.

Galleries 78, 82 and 83 were devoted to the Applied Art Section, to which reference has already been made. Mr. Halsey R. Ricardo kindly went to St. Louis, at the request of his Committee, to place all the objects in this Section, which were displayed in glass cases or upon the walls.

ABSTENTION FROM COMPETITION.

Following the example of France, we also withheld our Art Section from competition for awards, and in this decision we had the hearty support of the Applied Art sub-Committee. It may be added that the exhibits organised by the Education Committee of the Royal Commission were also withheld from competition.

INSURANCE.

All works sent to St. Louis were fully insured against all risks—fire, water, theft, damage, or loss—at rates ranging from 30s. to 50s. per cent., which were not unreasonable. The rates for sculpture ranged higher, being £3 3s. per cent. for bronzes

and £5 5s. for marble; and owing to the prohibitive rate no plaster was sent. It is gratifying to note that no serious damage of any kind occurred, and that the chief claims on the underwriters were confined to broken picture glasses and scratched frames, all of which were made good prior to their being returned to their owners.

EXPENDITURE.

A table is appended (Table III.), showing the chief heads of expenditure in comparison with those of former Exhibitions. It will be seen that while we had at St. Louis 554 exhibitors in the Fine Art Section, and 152 in the Applied Art Section, making a total of 706, the expenditure per head of exhibitors was only £17 5s. 3d., as against £19 1s. 6d. at Paris and £22 0s. 0d. at Chicago.

TABLE III.—COMPLETE STATEMENT OF EXPENDITURE OF BRITISH ART SECTION.

Exhibition.	Collecting, Packing, Transport and Redis- tributing.			Insurance.			Decoration of Section and Installation.			Salaries, Wages, &c.			TOTAL.			No. of Exhi- bitors.	Cost per Exhi- bitor.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.		£	s.	d.
Paris, 1889	1,322	0	0	1,225	0	0	617	0	0	700	0	0	3,864	0	0	300	12	17	6
Chicago, 1893	4,439	0	0	4,438	0	0	685	0	0	1,768	0	0	11,330	0	0	515	22	0	0
Brussels, 1897	1,167	12	11	1,210	13	2	166	0	0	400	0	0	2,944	6	1	259	11	7	0
Paris, 1900	2,132	4	7	1,391	1	1	848	4	4	1,020	14	8	5,392	4	8	282	19	1	6
St. Louis, 1904 *	5,056	4	5	2,898	4	10	2,265	1	0	1,969	9	0	12,188	19	3	706	17	5	3

* Including an Applied Art Section.

§ This amount does not include the following items, which in the case of previous Exhibitions were paid out of the General Expenses:—

	£	s.	d.
Hanging Committee	700	0	0
Travelling and Subsistence	1,660	0	8
Stationery and Printing	177	7	0
Incidental Expenses	106	1	10
	<u>2,643</u>	<u>9</u>	<u>6</u>

There were receipts to the amount of £205 4s. 10d. for sale of show-cases, catalogues, etc. The net total cost for the Art Sections at St. Louis was therefore £14,627 3s. 11d., or £20 14s. 4d. per exhibitor.

RETURN OF WORKS.

The Exhibition closed on the 1st December, 1904, and once more the efficiency of our organisation was illustrated by the

promptitude with which our exhibits were made ready for the home journey. Our Section was the first to be dismantled, and our exhibits the first to be re-packed and got away, notwithstanding the fact that the Exhibition Authorities afforded little or no assistance in expediting our departure.

SALES.

The sales of works in the British Section were satisfactory, being considerably larger than those effected in any other foreign section. They might have been larger still but for the high prices which some of our artists asked for their works in comparison with those asked by competing artists in other Sections. Whether this was altogether wise may well be questioned, seeing that foreign artists of the first rank find it to their advantage at these exhibitions to so adjust their prices as to encourage purchasers.

Another condition which perhaps militated against sales was the unfair treatment of British pictures by the American tariff. The United States duty upon paintings in oil and water-colours of English origin is 20 per cent. *ad valorem*, whilst upon pictures imported from France, Germany, Italy, etc., it is only 15 per cent. This preferential treatment of non-British art is a legitimate subject of complaint, seeing that whatever the corresponding advantages offered to the United States, they cannot compare with the normal freedom of access enjoyed by American products in this country. But the duties mentioned are not the only fiscal burdens placed on British art in the United States. Picture frames pay 35 per cent. of their value, and if covered with gold leaf 45 per cent. The duty on bronzes is also 45 per cent., and upon groups made from composite materials from 20 to 60 per cent. If in these circumstances the sales from the British Art Section were satisfactory, the credit obviously belongs to the exceptionally high merit of the exhibits.

CONCLUSION.

On the whole, the display made by the British Art Section at St. Louis was exceptionally successful. The impression produced in the Press both of this country and the United States was conspicuously favourable, and official expression was given to the public appreciation by Sir Mortimer Durand, His Majesty's

Ambassador at Washington, who in a dispatch to the Foreign Office, dated November 18th, wrote:—

“The British Art Section is generally regarded as containing the best collection of pictures in the Exposition.”

Mr. Humphry Ward wrote of it as follows:—

“Although the Committee have exercised a somewhat severe method of selection, they can justly point to the British contribution in the Department of Fine Art as among the best, largest, and most important that has ever been sent from our shores. It is equal, or superior, to the display made at Chicago, better than that made at Paris in 1900, and not inferior, in the opinion of good judges, to the remarkable collection sent to Brussels in 1897.”

In organising such an exhibition the difficulties are always formidable. There are difficulties in framing the lists of artists, in borrowing works that will do honour to the country, in obtaining others specially required from artists, in persuading private owners to part with their treasures, and in tracing the whereabouts of such treasures when they have passed through a variety of ownership, to be met sometimes with refusal in the end. Add to these other difficulties still more disappointing connected with adequate space and a suitable location in the Exhibition in which the display has to be made, and a faint outline of the impediments with which the British Art Committee for St. Louis was confronted may be imagined.

That all such difficulties were successfully grappled with is due in the first place to the liberality and public spirit of the 135 private owners, societies and provincial corporations who came forward to lend their valuable works for the honour of the nation, and to the not less public-spirited and zealous co-operation of the artists who responded to the Committee's invitation. To all of them the Committee wish to express their grateful acknowledgments.

We have to record, with deep regret, the loss through death of Mr. Val C. Prinsep, R.A., which took place, however, after he had rendered much valuable service to the Committee.

The warmest thanks of the Committee are due to Sir C. M. Watson, Secretary to the Royal Commission and Commissioner General at St. Louis, who did everything in his power to

assist the Fine Art Committee in their sometimes difficult dealings with the Exhibition Authorities.

The thanks of the Committee are especially expressed to Sir Isidore Spielmann, who acted as one of the Honorary Secretaries, and whose services, gratuitously rendered, contributed so largely to the success of the Exhibition. His unremitting attention to the interminable duties of organisation and administration, during a period of over two years' hard work, demands more than a passing recognition.

To Mr. Fred A. Eaton, Secretary to the Royal Academy, who also acted as Secretary in an honorary capacity, the Committee are indebted for the assistance which he gave with his well-known tact and judgment at the deliberations of the Committee, and for other services, more especially in connection with the transport and insurance of the works of art.

An important feature in the success of the Exhibition was contributed by Mr. E. J. Gregory, R.A., P.R.I., and Mr. Alfred Parsons, A.R.A., by the trouble which they took and the judgment they displayed in the arrangement of the pictures and other works of art, which was universally considered to have been carried out with admirable taste and impartiality.

For the successful result in sales of pictures we are largely indebted to Mr. Reginald S. Hunt, our representative on the spot, who had charge of this Department, and whose services in that and in the many other ways in which he assisted the Honorary Secretary in his work are much appreciated by the Committee.

EDWARD J. POYNTER,
Chairman of the Art Committee.

REPORT OF THE SUB-COMMITTEE FOR APPLIED ART.

BY WALTER CRANE, ESQ., PRES. ARTS AND CRAFTS EXHIBITION
SOCIETY.

CONSTITUTION OF SUB-COMMITTEE.

At the invitation of the Royal Commission, through the Art Committee, presided over by Sir Edward J. Poynter, Bart., P.R.A., I was appointed to form a representative British Exhibit of Applied Art, or Arts and Crafts, in the Fine Art Section, with the assistance of the following gentlemen, who were eventually selected to form the sub-Committee for this purpose, with myself as Chairman:—

W. A. S. Benson, Esq.
Walter Cave, Esq.
George Frampton, Esq., R.A.
Edward S. Prior, Esq., Hon. Sec.
Halsey R. Ricardo, Esq.
C. F. A. Voysey, Esq.
Emery Walker, Esq.

Mr. Alfred A. Longden was appointed to act as Secretary to the sub-Committee in London, and as its representative at St. Louis.

CLASSIFICATION OF SECTION.

The official title of our group was "Original Objects of Art-workmanship" (Arts & Crafts), and the works (under Group 14 of the Exhibition Classification) included:—

- Class 38. Art work in glass.
- „ 39. Art work in earthenware.
- „ 40. Art work in metal.
- „ 41. Art work in leather.
- „ 42. Art work in wood.
- „ 43. Art work in textiles.
- „ 44. Artistic bookbinding.
- „ 45. Art work not covered by any other group.

Thus, for the first time in any Universal International Exhibition, it is satisfactory to record that "Original Objects of Art Workmanship," generally comprehended under the terms "Arts and Crafts," took their place as part of the Fine Art Section.

MEETINGS OF SUB-COMMITTEE.

The sub-Committee duly got to work, and the questions of invitation, transport, insurance, planning the galleries, etc., were fully discussed. With the aim of securing as representative a show as possible, invitations were sent to all the best known designers and craftsmen of the Kingdom in every class of work, inviting them to submit works to the Committee for selection.

SELECTION OF WORKS.

There was a good response to the invitation, some 1,200 works being submitted. The works were collected at Messrs. Dicksee's for the judgment of the sub-Committee, and we were able to select from them a fairly representative show of recent British work in design and handicraft, which was forwarded to St. Louis in due course. The actual exhibitors numbered 156, while the number of exhibits was 420. In most cases the exhibitor was also the executant, but in others executants collaborated whose names did not appear as the exhibitors of the work, so that a larger number of crafts were concerned than would appear from the names of the exhibitors alone.

COLLECTION, PACKING AND TRANSPORT.

The exhibits were collected by Messrs. Dicksee, and packed in 26 cases, those works which were thought to be liable to damage by sea risk, etc., being packed in zinc-lined cases.

SPACE.

Position of Section.

The galleries assigned to our section were Nos. 78, 82 and 83 in the British Art Section of St. Louis, the exhibiting wall space being 1,611 square feet, and the area of the floor 3,110 square feet. The chief gallery, 83, was approached by the main doorway from the south.*

* See Plan, page 74.

Decoration, Lighting, etc.

At the request of the Art Committee I designed a scheme of decoration for the walls of the British Art Section, which was approved by them and by the sub-Committee. The walls of the Applied Art Section were hung with a pale biscuit-coloured "burlap" tapestry, which was rendered less lustrous by the treatment with a fire-resisting solution required by the Authorities.

The walls were finished with a deep frieze of heraldic character. The varieties of the British National and Royal bearings being given in full colours on a series of shields connected with scrolls and emblematic foliage upon a cream-tinted burlap. This frieze was painted by myself, with the assistance of Mr. W. T. Cleobury.

The floor was covered with linoleum of a neutral green shade in harmony with the general scheme.

INSTALLATION, HANGING, ETC.

Representative.

Mr. Halsey Ricardo was appointed by the sub-Committee to go out to arrange the exhibits (Mr. Alfred A. Longden having previously left), and he arrived at St. Louis on April 14th, and reported that, "Thanks to the excellent arrangements already made, he found everything in good order and ready for placing."

The burlap hanging and the decorative frieze to the three rooms were already fixed, and the show-cases were on the spot.

Mr. Halsey Ricardo's Report.

"Speaking generally," Mr. Ricardo says, "the exhibits had been well packed and had arrived unharmed. The actual injuries have already been reported on by Mr. Longden; considerable credit is therefore due to Messrs. Dicksee on this account, seeing that the methods of American transport are transacted with extraordinary violence."

Effect of Light.

The daylight of St. Louis, and in America generally, so far as there was opportunity of observing, "is brilliant and searching beyond that even of Southern Italy, and although the two smaller rooms were lit only by a small skylight each, the light was ample; and there were no dark corners."

Office.

He found on arrival "that a portion of one of the small rooms had been screened off to serve as an office for the officials of the British Fine Art Exhibits. This screen—for it was no more—somewhat lessened the available wall and floor space for exhibition; but as there proved a sufficiency in both these respects, and the screen itself was serviceable, the sub-Committee may regard its intrusion as a matter of no great consequence. The large central room was very finely lit by means of a skylight and four large windows on the south side"; in fact it was "expected that the light from the windows, in the summer, would be greatly in excess of what would be wanted," and instructions were left with Mr. Longden "to arrange for outside blinds for these windows if the occasion required them."

Photographs of the Galleries.

Arrangements were made that photographs should be taken of all three rooms, to show—as far as possible—the disposition of the exhibits.

Stained Glass.

Permission was obtained from the Authorities to cut out the glazing bars, etc., where wanted, and to insert the panels of stained glass in the windows themselves. He stated that more examples of stained glass would have been very welcome, since those we fixed had a very decorative effect.

The heraldic panel of the Arms of England came very fortunately in the fanlight over the entrance door, emphasizing the heraldic treatment of the frieze and making itself visible from the corridors and room of the Fine Art Section.

Grouping.

Mr. Ricardo's aim in placing the works, as he hoped the photographs would show, "was to keep the work of each Exhibitor together," and he "came early to the conclusion that coloured objects, especially where the colour was full and deep, looked better in the smaller and darker rooms; the strong and searching light of the large room appeared to give an unexpected and wrong value to the different colours employed in each exhibit."

General Effect.

It was generally considered that "our Section of the Fine Art Division had a distinguished look; there was sufficient wall space to allow each object its proper place without being oppressed by its neighbour.

"The rooms looked, when completed, spacious and airy; the colour of the burlap tapestry was agreeable—though rendered patchy and less lustrous by the treatment of a fire-resisting solution imposed by the Authorities, to which I have already referred."

Show-cases.

The show-case accommodation proved ample. The opening of the Exhibition took place on Saturday, April 30th. Mr. Ricardo left St. Louis on Thursday, 28th, by which date every object had been placed, hung, and numbered to tally with the Catalogue, and the British Fine Art exhibit was complete and ready by the opening day, which I believe could be said of no other nation there represented.

The sub-Committee owe this successful result to the untiring and assiduous labours and experience of Sir Isidore Spielmann in England, to the ability of the British Commissioner-General and his Staff at St. Louis, and, specially, to the care and attention of Mr. A. A. Longden and Mr. R. S. Hunt; it was by their co-operation and willingness that Mr. Ricardo's task was made "as smooth and as pleasant to me as such help could be." A vote of thanks was unanimously passed by the sub-Committee to Mr. Halsey Ricardo on his return, for his services in going out and arranging the Applied Art Section, in which I desire heartily to join, as well as in the acknowledgment of the excellent services of Sir Isidore Spielmann and the Staff at St. Louis.

Opening Day.

Mr. Alfred A. Longden reported that "the British Applied Art Section was ready on the opening day, and after the formal ceremonies were over it was visited by a large number of people."

Attendances.

The attendance was on several occasions taken at different periods of the day, and it was found that the average was about 400 an hour.

Numerous critics and reporters from New York, Chicago, Boston and other parts of the States, as well as representatives of foreign papers and magazines, visited the Section continually, and large parties with guides were to be seen daily.

The attendance was excellently maintained during the entire exhibition, with the exception of certain cold days in November, when the well-heated American Section drew away numerous people.

The American Section was excellently heated, whereas the exhibits of all Art Sections from other countries were placed in unheated, temporary buildings.

Appreciation of Exhibits.

The exhibits which seemed to be most generally appreciated were those in the hand-weaving, needlework, printing, calligraphy and book-binding sections, and several people expressed a wish to start Applied Art industries in the States, and came for suitable information.

The frieze in all of the galleries was much admired.

The sale of work was better in this section than in any other except in the French, where the excellent amount taken was entirely due to the very fine jewellery exhibit by Lalique, who made a wonderful effort to exhibit something new and really beautiful, whereas the British workers in jewels and precious stones made little or no effort to submit anything original, and many of our best craftsmen were afraid to exhibit, fearing that their designs would be copied.

Allowances, however, must be made for the essential difference between English and French tastes and ideals in design, and it should be remembered the English are generally credited on the Continent with being the originators of the whole movement in artistic design and craftsmanship.

The glass and pottery sold well in spite of the fact that the average visitor purchased work of this kind in the Manufactures and Varied Industries Buildings, where such exhibits were much more numerous.

The fact that most of the works were subject to a duty of 60 per cent. greatly diminished the Applied Art sales.

The system of numbering was somewhat confusing as the exhibits did not run consecutively. A better plan would have been to put a label on each work including the name of the

exhibitor and the nature of the exhibit. People as a rule did not look at the catalogue.

CONCLUSION.

Suggestion for a Central Office as an Exhibit.

Mr. Longden ventured to think that a central office for the Secretary or representative would have greatly increased the number of sales. An excellent plan was adopted in the German Section, an exhibitor contributing a secretary's office as his Applied Art exhibit; this office being in a central position and a very well-planned exhibit, the scheme seemed a good one.

Comparison of British Applied Art Exhibit with that of other Countries.

Comparing the British Exhibit with that of other countries, it was larger and in most ways better. The number of Applied Art works exhibited by the various countries in the Art Building was as follows:—

United States, 945; Great Britain, 420; France, 220; Austria, 190; Germany, 70; Holland, 65, and Russia, 39.

Thus it will be seen that our exhibit was only second to the United States. The French jewellery and the Japanese needlework were undoubtedly superior to anything of the kind in any other section, but in other branches of Applied Art we held our own, and in several cases we undoubtedly took the lead.

Mr. Longden remained to see all the unsold or loaned works in this section packed and dispatched on their return journey, and these have all been received and returned to their respective owners, with comparatively few and slight cases of damage. I offer Mr. Longden the best thanks of the sub-Committee and my own personal thanks for the ability and efficiency with which he has carried through the difficult and complex work devolving upon the Secretary of the Applied Art (Arts and Crafts) Section and the intelligence and readiness he has always shown.

WALTER CRANE,

Chairman of the sub-Committee.

REPORT OF THE LIBERAL ARTS COMMITTEE.

BY THE RIGHT HON. VISCOUNT PEEL.

The Department of Liberal Arts at the St. Louis Exhibition included thirteen groups which were as follows :—

- Group 15.—Typography.
- Group 16.—Photography.
- Group 17.—Books, Publications and Bookbinding.
- Group 18.—Geography and Topography.
- Group 19.—Instruments of Precision, Coins and Medals.
- Group 20.—Medicine and Surgery.
- Group 21.—Musical Instruments.
- Group 22.—Theatrical Appliances.
- Group 23.—Chemical and Pharmaceutical Arts.
- Group 24.—Manufacture of Paper.
- Group 25.—Civil and Military Engineering.
- Group 26.—Models and Plans of Public Works.
- Group 27.—Architectural Engineering.

It was decided to have British exhibits in all these groups with the exception of 20, 22, and 24, and sub-Committees were appointed to organize these exhibits. The Chairmen of these sub-Committees were as follows :—

For Groups 15 and 17, Chairman, Sir E. Maunde Thompson, K.C.B., I.S.O.

For Group 16, Chairman, Sir W. de W. Abney, K.C.B.

For Group 18, Chairman, Sir Clements R. Markham, K.C.B.

For Group 23, Chairman, Sir Boverton Redwood, F.R.S.E.

As regards Group 19, Professor C. Vernon Boys, F.R.S., undertook to supervise the collection of exhibits of Instruments of Precision, and the Right Hon. W. G. Ellison-Macartney, Deputy-Master of the Mint, agreed to prepare a collection of British coins and medals and of the Great Seals of England.

The exhibits in Groups 25, 26 and 27 were arranged for by Mr. L. F. Vernon-Harcourt, M.A., M. Inst. C.E.

In Group 21, which was not considered of sufficient importance to warrant the appointment of a sub-Committee, there was shown a good collection of wind instruments by various makers.

Reports by the chairmen of the different sub-Committees, and by the other gentlemen named above, are annexed, which give full details as to the scope of the different exhibits in each group.

The awards allotted by the International Jury to the British exhibitors in the Department of Liberal Arts were as follow :—

Groups.	Grand Prizes.	Gold Medals.	Silver Medals.	Bronze Medals.
<i>Exhibitors.</i>				
Groups 15 and 17 . .	4	8	2	1
Group 16	8	29	20	21
Group 18	6	2	..	1
Group 19	3	4	3	2
Group 20	2	..	..	2
Group 21	1	2	..	..
Group 22 . . . .	..	..	..	1
Group 23	16	29	23	21
Group 24 . . . .	..	..	..	..
Groups 25, 26 and 27 .	13	10	6	2
Totals	53	84	54	51
<i>Collaborators.</i>				
Groups 15 and 17 . .	1	4	2	..
Group 16 . . . .	..	..	..	..
Group 18 . . . .	..	1	2	..
Group 19 . . . .	..	1	..	1
Group 20 . . . .	..	1	1	..
Group 21 . . . .	..	1	..	..
Group 22 . . . .	..	..	..	..
Group 23 . . . .	..	3	5	3
Group 24 . . . .	..	..	..	..
Groups 25, 26 and 27 .	4	5	4	1
Totals	5	16	14	5

The total area allotted to Great Britain and Ireland in the Palace of Liberal Arts was 37,850 square feet. This space, which was in an excellent position in the northern angle of the building, was enclosed with an ornamental façade composed of columns and frieze, and over each of the entrances into the court was inserted the words "Great Britain and Ireland."

The most important exhibit in the British section of Liberal Arts was that of the chemical industries of Great Britain, which covered an area of 11,830 square feet. In addition to the exhibit in the building, the Chemical sub-Committee arranged

for the installation of a low temperature plant for the production of liquid air and liquid hydrogen. This plant was installed in a space in the Exhibition grounds at a little distance from the Liberal Arts building.

The Committee desire to express their sincere thanks to the sub-Committees and to the other gentlemen, who, by their strenuous efforts, succeeded in obtaining such excellent results in the British section, and also to their Secretary, Mr. E. H. Lloyd, upon whom fell the work of transportation of the exhibits, and of the installation at St. Louis.

PEEL,

Chairman of the Committee.

REPORT OF THE SUB-COMMITTEE FOR
TYPOGRAPHY AND PUBLICATIONS.

BY SIR E. MAUNDE THOMPSON, K.C.B., I.S.O.

With the view of organizing a collective exhibit of books which might demonstrate the progress made during recent years in the art of printing in the United Kingdom, the Liberal Arts Committee communicated with the Publishers' Association, in the hope that that body would undertake to control the selection of the best examples, as they had done with marked success for the Paris Exhibition of 1900. Unfortunately the stringent provisions of the American copyright laws have aroused a considerable feeling of dissatisfaction among publishers in this country, and the Publishers' Association did not see their way to comply with the request. The Liberal Arts Committee therefore decided to act for themselves and to form a representative collection of publications for exhibition at St. Louis (Group 17).

With this view they appointed a sub-Committee consisting of Sir Edward Maunde Thompson, K.C.B., I.S.O. (Chairman), and Mr. Emery Walker and Mr. Laurie Magnus, to whom was entrusted the duty of collecting and selecting and cataloguing the exhibits.

The sub-Committee commenced their labours by addressing to the principal firms of publishers and printers invitations to contribute towards the proposed collective exhibit; and so liberally was the appeal responded to, that the limited space in the Exhibition galleries which had been at first assigned to Groups 15 and 17 was found inadequate and had to be enlarged. For the general standard of excellence of the books submitted was so high that, even after a careful selection and a rigid exclusion of inferior examples, the collection deemed worthy of exhibition proved far larger than had been anticipated. The sub-Committee venture to think this result most creditable to the publishers and printers who contributed to it.

The difficulty of sorting and arranging a large mass of objects of all sizes, such as books, and of fitting them into

show-cases of fixed dimensions, is one which causes an amount of toil and an expenditure of time which can hardly be appreciated by those who have never undertaken such a task. The sub-Committee are conscious that the orderly arrangement which they would have desired to maintain throughout the collective exhibit was not infrequently dislocated by the exigencies of space, and that the pressure of time under which they had to work prevented them from attaining to the perfect adjustment which they desired. Subject, however, to these unavoidable shortcomings, the collection formed a very handsome exhibition, and, as the sub-Committee are gratified to know, it received the award of a Grand Prize.

The general series of books (including a certain number of musical publications) amounted to 462 examples. In addition to these, 124 specimens of educational and scientific publications formed a subsidiary group; and it was thought proper that a certain number of sixpenny editions (a modern and excellent feature in the British book trade) and that a special series of Biblical and Liturgical works should be added. The group was closed with a small selection of bookbindings by the best British binders.

A catalogue was carefully compiled; the names of publishers and printers being individually recorded.

For the purposes of Group 15, the Liberal Arts Committee also requested Sir E. Maunde Thompson to endeavour to collect and arrange for exhibition a series of British engravings and prints, with a view to illustrate the progress made in recent years in the branch of artistic reproduction. He succeeded in gathering a very interesting series of 138 examples which were contributed by a certain number of London firms, and which formed a most attractive exhibition in conjunction with the collective exhibit of books. The high merit of these engravings and prints, not only as skilful examples of exact workmanship but also as works of art, showed to great advantage. A carefully-compiled catalogue of this group was also issued.

E. MAUNDE THOMPSON,
Chairman of the sub-Committee.

REPORT OF THE SUB-COMMITTEE FOR PHOTOGRAPHY.

BY CAPTAIN SIR W. DE W. ABNEY, K.C.B., F.R.S.

At a meeting of the Liberal Arts Committee held on 20th March, 1903, I was requested to endeavour to form an exhibit of photographs, and power was given me to co-opt any members to form a sub-Committee for this purpose. Accordingly a Committee was formed consisting of:—

Captain Sir W. de W. Abney, K.C.B. (*Chairman*).
A. W. Bartlett, Esq.
Reginald Craigie, Esq.
G. Davison, Esq.
A. Horsley Hinton, Esq.
Sir J. Benjamin Stone, M.P.

It was decided that the entire exhibit should be divided into three sections—

1. Pictorial Photography.
2. Scientific Photography.
3. History Photographs.

And the following gentlemen made themselves responsible for the three divisions:—

Mr. Horsley Hinton for Pictorial Photographs, the Council of the Royal Photographic Society for the Scientific Collection, and Sir J. Benjamin Stone for History Photographs.

The result was that an exceedingly good photographic exhibit was obtained, the Royal Commission paying all the cost of collecting, insuring, installing and transport, and returning the exhibits at the close of the Exhibition.

During the past ten years, whilst the scientific and technical aspects of photography have been vigorously progressing, a still greater development has taken place on that side of photography which is usually described as the "pictorial," meaning thereby the application of photographic means to the expression of a personal impression founded upon Nature; and in view of the enormous hold which this application of photography has

obtained over the public mind in practically every civilized country, and especially in America, the Chairman, Sir William Abney, expressed a wish that pictorial photography should be specially well represented at St. Louis, and for this purpose Messrs. Reginald Craigie, George Davison, and A. Horsley Hinton were asked to draw up a list of the most representative exponents of pictorial photography in Great Britain who should be invited to lend their works. Accordingly some fifty-nine exponents of pictorial photography were invited to contribute certain of their works particularly specified in the invitation, which it was considered would efficiently represent the development of photography in a pictorial direction as it stands at the present day. The only works by a deceased artist were three pictures by the late Mr. H. P. Robinson, who was so largely instrumental in promoting the present-day movement that he may be considered contemporary with those who have survived him. It may confidently be stated that on no previous occasion has so complete and thoroughly representative a collection of the pictorial photography of Great Britain been brought together.

It should be borne in mind that in this eminently popular phase of photographic practice no attempt is made to exploit the perfections of the process or to demonstrate any personal skill of the producer as a craftsman, but to use much or little of the facilities which the process gives, to produce an individual idea or impression rather than a transcript of Nature.

Amongst the two hundred and thirty-nine pictures shown, with the exception of a few examples of printing on gelatino-bromide of silver paper, all the prints were in platinotype carbon processes or the more modern gum-bichromate pigment method. A considerable number of the prints were of large size, some of them measuring as much as 36 by 24 inches; and in accordance with present-day convention, and with a view to enhancing the effect of the prints themselves, the great majority were framed in heavy dark wood mouldings selected by the exhibitors.

Modern pictorial photography has, as might be expected, divided itself into various schools or styles, and no one of these more than another was exemplified by the collection; the more academic or technically orthodox photographic picture being represented by such workers as Ernest R. Ashton, Constance Ellis, A. Horsley Hinton, and Frederick H. Evans; whilst the

extreme impressionistic school was exemplified by the work of J. M. C. Grove, Charles Moss, and Alexander Keighley. The fifty-nine exhibitors were chosen quite irrespectively of their being either amateur or professional photographers, but most prominent amongst the latter were James Craig Annan and Frederick Hollyer.

Contrary to the custom prevailing in photographic exhibitions in this country, the works of each exhibitor were hung together in a group, thus enabling the student to form a complete idea of the scope of each exhibitor's art. The hanging was carried out under the personal direction of Mr. Horsley Hinton, the Royal Commission providing a suitably draped background in accordance with his design. This background was of coarse buff canvas, each group of pictures forming an independent panel separated from the next adjacent by strips of white wood which was continued at the top and bottom and capped by a grey frieze and white moulding; the general effect illustrating how greatly the merits of a picture may be assisted or marred by the picture's environment.

The American photographic papers spoke in particularly high terms of the British section of pictorial photography as clearly demonstrating a serious motive and earnest endeavour; and it is safe to assert that the section will maintain the supremacy of Great Britain in this particular branch of photographic activity, which, although it has since been enthusiastically taken up by certain prominent workers in almost every other country, found its origin, or at least made its first organised effort, in London some thirteen years ago. At this time the London Photographic Salon was established, which has since annually carried out its original design of holding an exhibition confined exclusively to photographs which, in the opinion of a select jury, give evidence of personal artistic intention without any reference to the means or method employed.

The Northern Photographic Exhibition being held in Leeds shortly after the photographs were returned to London from St. Louis, the consent of individual exhibitors was first obtained and then the whole of the collection was installed in the South and East Rooms of the City Art Galleries in Leeds. The original scheme of wall decorations and system of hanging was repeated, and a large section of the public were thus afforded an

opportunity of seeing the unique assemblage of photographic works which so creditably represented their country at the World's Fair.

The exhibits of scientific photography were not very numerous, but were of great interest. The Royal Observatory, the Solar Physics Observatory, the Royal Observatory at Edinburgh, and the Stonyhurst Observatory sent specimens of the photographic work carried out at their Institutions; conspicuous amongst their exhibits were photographs of eclipses and of stellar and solar spectra. University College, Sheffield, sent photographs exemplifying the biology of flowers, and the British Association, through one of its Committees, sent a collection of geological photographs.

The exhibits in photomicrography were numerous. Mr. Stead showed microphotographs illustrative of researches in iron and steel, in connection with which subject the exhibit of the Great Eastern Railway must be mentioned. Dr. Spitta and several other men of science contributed examples of photomicrographs in other directions.

Major-General J. Waterhouse sent for exhibition a collection of what may be termed historical process prints, amongst them being examples of his own process, the "Waxed-Sand."

Various other exhibitors contributed to the scientific collection, which was exhibited in London before being finally dispersed.

The history photographs, which consisted of a small series from Sir J. Benjamin Stone's large collection, were of special interest, and many of the scholastic institutions of St. Louis arranged parties of their students to inspect them. Full details of these photographs will be found in the official catalogue, which contains a special introduction and explanation of each photograph.

The total amount of space occupied by the display of photographs was 4,626 square feet of floor space, and 6,912 square feet of wall space.

W. DE W. ABNEY,

Chairman of the sub-Committee.

REPORT OF THE SUB-COMMITTEE FOR GEOGRAPHY AND EXPLORATION.

BY SIR CLEMENTS R. MARKHAM, K.C.B., F.R.S.

The sub-Committee of the Liberal Arts Committee, which was appointed by the Royal Commission to arrange the Collective Exhibit in Group 18 (Geography, Cosmography and Topography), was composed of representatives of the following Departments and Societies :—

The Ordnance Survey of Great Britain and Ireland.

The Intelligence Division of the War Office.

The Survey of India.

The Royal Geographical Society.

The Palestine Exploration Fund.

The Egypt Exploration Fund.

The Cretan Exploration Fund.

The names of the Members of the sub-Committee are given in the list on page 29.

The object of the exhibit was to give a general idea of the work being done by Great Britain at home and abroad in Geography, Topography and Exploration, and, in addition to the Institutions mentioned above, the Hydrographical Department of the Admiralty, Mr. Edward Stanford, Messrs. W. & A. K. Johnston, Limited, Messrs. Cary, Porter, Limited, and Messrs. John Bartholomew & Company, contributed to the Collective Exhibit.

A ground floor area of 3,572 square feet in the Department of Liberal Arts was allotted for the purpose, and on this space screens were provided upon which the exhibits were arranged in such a manner that every map and diagram could be seen and studied to advantage. The total length of screens erected was 300 feet and the height of the screen was 12 to 15 feet. The floor space between the screens was allotted to models, cases of instruments, books, etc.

The division of floor space and screen area between the

different Departments and Societies was as follows. The dimensions are in square feet:—

	Floor Space.	Screen.
The Ordnance Survey	192	480
The Intelligence Division of the War Office . . .	174	375
The Hydrographical Department of the Admiralty	264	336
The Royal Observatory	464	192
The Survey of India	228	564
The Royal Geographical Society	492	1,242
The Palestine Exploration Fund	492	1,215
The Cretan Exploration Fund	264	432
The Egypt Exploration Fund	264	432
Mr. Edward Stanford	228	612
Messrs. W. & A. K. Johnston, Limited	228	504
Messrs. Bartholomew & Company	282	495

The following is a brief account of the different exhibits:—

The Ordnance Survey.—The exhibit comprised specimens of the different maps issued by the Survey on scales of one inch to the mile, and on the scales of one inch to two, four and ten miles respectively; also of town plans on the scales of six inches to the mile, $\frac{1}{500}$, $\frac{1}{2500}$ and five feet to the mile.

The Intelligence Division of the War Office.—The maps shown illustrated the work done by the War Office in collecting information respecting unsurveyed or partially surveyed countries, especially with a view to past or prospective campaigns, and for assistance in the delimitations of international boundaries in countries, the geographical features of which are little or altogether unknown. Maps were exhibited illustrative of the Anglo-French boundary in West Africa, the Anglo-German boundary between Lakes Nyasa and Tanganyika, the territory of Uganda, the Egyptian Soudan, etc.

The Hydrographical Department of the Admiralty.—The collection comprised specimens of original manuscript charts, and published charts of coast lines in different parts of the world, and also a number of the special types of instruments used in the British Hydrographical Service.

The Royal Observatory.—The exhibit was composed of photographs of the Observatory and of the telescopes and other instruments used for Astronomical work; also photographs of the Astrographic chart of the sun, eclipses, etc.

The Survey of India.—The collection included a series of maps illustrative of the work of the Survey Department in

Geography and Topography, in the measurement of arcs of longitude, and the preparation of tidal tables.

The Royal Geographical Society.—The Society lent an excellent collection of maps of all parts of the world published during recent years; of photographs illustrating the progress of exploration conducted by persons connected with the Society, and of works of travel and discovery recently published by them. The exhibit included a collection of instruments for the use of travellers and geographical surveyors, made by Messrs. Cary, Porter, Limited, of London.

The Palestine Exploration Fund.—The collection lent by the Fund was fully illustrative of the work of exploration in Palestine carried out by the Society since its foundation. It included large and small scale maps of the country and the raised maps made by Mr. Armstrong, the Secretary, on a scale of three-eighths of an inch to the mile. A complete set of the publications of the Fund and photographs of recent explorations were also shown.

The Egypt Exploration Fund.—The exhibit included drawings and photographs illustrative of recent exploration in Egypt, and a collection of publications of the Society.

The Cretan Exploration Fund.—An excellent collection of photographs of the Palace of Knossos in Crete, recently excavated by the Society, were exhibited, as well as photographs of tablets and other interesting objects found during the progress of the work.

Mr. Edward Stanford.—The exhibit included atlases and maps of all parts of the world, geographical publications and guide-books for the use of travellers.

Messrs. J. Bartholomew & Company.—The collection comprised atlases; orographical, geological and meteorological maps of different parts of the world.

Messrs. W. & A. K. Johnston, Limited.—The exhibit was composed of maps, atlases, wall diagrams and geographical publications.

The position allotted to the British Geographical Section proved a very satisfactory one, as it was close to one of the main gangways in the Department of Liberal Arts, and it was viewed with considerable interest both by American visitors and those from foreign countries.

The total cost of the exhibit to the Royal Commission for

transport and installation was £497 12s. 10d., and we venture to think that the amount was well expended, having regard to the assistance given by it to the diffusion of geographical knowledge. The spread of knowledge in this way would appear to be one of the advantages of International Exhibitions, even if it may not bring an immediate return from the commercial point of view.

CLEMENTS R. MARKHAM,
Chairman of the sub-Committee.

REPORT ON THE EXHIBIT OF INSTRUMENTS OF PRECISION.

BY PROFESSOR C. VERNON BOYS, F.R.S.

At the meeting of the Liberal Arts Committee, held on March 20th, 1903, I was requested to undertake the work of forming a Collective Exhibit under Group 19, Instruments of Precision. Owing to the small response to the circular letters sent out to leading manufacturers of this class of instruments, I used my personal influence in obtaining as representative a display as possible. After making several inquiries, it was found that it would be impossible to organise such an exhibit unless the Royal Commission were prepared to undertake to pay the whole of the expenses for carriage to and from St. Louis, and to provide the necessary show-cases in which to display the exhibits.

On this request being acceded to by the Executive Committee, I reported on June 11th that I was endeavouring to form a good exhibit on the lines indicated, and pressing letters were dispatched to a number of firms asking them to co-operate with the Royal Commission in organising a display, and in the end favourable replies were received from twelve firms.

The Instruments of Precision and Philosophical Apparatus generally, forming part of Group 19, were represented by a small exhibit, but one very characteristic of the work of this country. The makers of instruments are under a great disadvantage as compared with our great manufacturers, in that the trade is necessarily a small one, and the advantages to be derived from exhibiting are not so great in proportion to the anxiety and expenditure as in the case of more extensive manufacturers.

On this account it was not possible to persuade many of our best-known makers to take part. On the other hand, a small number, each representing the highest quality of work in some branch of construction, contributed to a Collective Exhibit, which, though small, was of a very high quality.

Sir Howard Grubb, F.R.S., the well-known designer and constructor of large telescopes, provided a centre-piece consisting

of an electrically-driven equatorial, and also a number of instruments with his ingenious and highly effective sight.

The Echelon Spectroscope exhibited by A. Hilger represents the highest development of accuracy in optical construction; the art of the optician and the daring originality of the inventor (Michelson) are in no instrument more worthily combined.

The drawing instruments and theodolites of Stanley & Co., the miners' surveying instruments and the slide rules for calculating of Davis & Son, and the optical lanterns of Newton & Co., are in their several directions the best, or among the best, that this country produces. Fleuss has shown that mechanical engineering is capable of producing a vacuum pump almost equal to the famous Sprengel pump for perfection of result, while in speed there is no comparison between them. The Cambridge Scientific Instrument Co., who are well known for the originality of their design and the perfect finish of all their work, exhibited a number of instruments with which their name is associated. To Mr. Thomas Thorp the lecturer and investigator owes a debt of gratitude for enabling him and his students to work with celluloid casts of the expensive Rowland gratings, the cost of which is insignificant, and which in some respects seem to be even more perfect than the originals.

Aitchison & Co. appeal more to the general public by providing field-glasses of original design, with which they are determined to stem the attack on the British optical trade by continental makers.

Of the calculating machines exhibited by Mr. Joseph Edmondson and C. & E. Layton, the characteristic of the first is the original design of the circular machine, extending its scope more especially in division, and of the second is the extremely strong and substantial workmanship, and the quiet working, which specially fit it for the heavy work of insurance offices.

There was one instrument, shown by Griffin & Sons, which, for want of a proper home, found shelter among optical and other physical appliances; this was the Chloroform Inhaler of Mr. A. Vernon Harcourt, F.R.S., a device by which those who administer chloroform may know precisely what proportion of chloroform and air is being inhaled, and may vary this proportion as desired. It may, therefore, with some propriety, be classed among the Instruments of Precision.

C. V. BOYS.

REPORT ON THE EXHIBIT OF COINS AND MEDALS.

BY THE RIGHT HON. W. G. ELLISON-MACARTNEY.

The exhibit prepared at the Royal Mint for the International Exhibition, St. Louis, consisted of medals, coins and seals arranged in six sections or groups to illustrate the past and present work of the Department.

Group A.—Medals began to be awarded by the British Government for naval and military services in the early part of the nineteenth century, the Waterloo medal being the first of these decorations. In this group (A) a display was made of the entire series of the naval and military medals with clasps and ribbons issued from 1815 to 1902. The series comprised 172 silver and bronze medals (each medal being in duplicate), and 203 clasps. In the case of the clasps a selection only was shown, as in some instances the full complement is inconveniently large for display.

Group B.—The Board of Trade present silver and bronze medals for gallantry and humanity in saving life. Special medals are also awarded by the same Department to foreigners for saving the lives of British subjects and for assisting British vessels in distress. Specimens of these medals in duplicate, amounting to thirty in all, were shown in this group (B). The series included two sets, one of which bore the effigy of Queen Victoria, and the other that of King Edward VII.

Group C.—On the accession of King Edward VII., the Deputy-Master of the Mint was called upon to prepare new seals for the various Home and Colonial Government Offices. Lead impressions of all the seals that were completed at the time of despatching the Mint exhibit to St. Louis were included in this group (C). The collection comprised ten seals for Great Britain and Ireland, and fifty-two seals for various British Colonies and Dependencies.

Group D.—The Coronation medals of King Edward VII. were struck in the Mint in 1902, the modeller and engraver of the dies being the late Mr. G. W. De Saulles. Specimens of

these medals were exhibited in this section (D) along with a series of electrotype reproductions of the known gold Coronation medals from the time of Edward VI. This series, covering a period of more than 350 years, and including medals commemorative of thirteen coronations, contained specimens of the work of the more famous of Mint engravers, such as Nicholas Briot, Thomas Simon, John Roettier, John Croker, Benedetto Pistrucci, and William Wyon.

Group E.—Nearly the whole of the varied currency of the British Empire is struck at the Royal Mint. The exceptions are the gold coined in the Australian Branch Mints and the coins struck at the Calcutta and Bombay Mints, chiefly for British India. Duplicate specimens of the gold, silver, bronze and nickel coins of various denominations current in the British Empire were prepared and arranged in three classes, viz.—(1) Imperial Currency, (2) Colonial Currency, and (3) British Indian Currency.

After the accession of King Edward VII. new obverse dies bearing His Majesty's effigy were engraved for striking the Imperial and Colonial coins. Nearly all the 164 coins exhibited in this group bore the uncrowned bust in the case of Imperial coins, and the crowned bust in the case of Colonial coins. The exceptions were in regard of some Colonies which had not, up to the time of completing the Mint exhibit (January, 1904), applied for supplies of coin bearing the new obverse design.

Group F.—This branch of the exhibit occupied six large show-cases, each 3 feet 3 inches by 2 feet 9 inches. The cases contained electrotype copies of the Great Seals of England, extending from the reign of Offa, King of Mercia (A.D. 757–796) to the present time. Offa, whose seal begins the series, was the king who first struck pennies, a denomination of coin which has formed a characteristic item of British currency from that day to this.

The total number of seals and counterseals represented in the series was 168. These, extending over a period of eleven centuries, presented many features of historical interest, the seals in some cases having been used to attest documents associated with some of the most important epochs in the history of Great Britain and the world. They also afforded at one view a unique opportunity of judging of the progress made

by successive generations in the arts of design, modelling, and die-engraving. The English seals of the Middle Ages are justly admired for their delicate execution, and for the skilful manner in which minute details are introduced and subordinated to the general effect of the whole design.

W. G. ELLISON-MACARTNEY.

REPORT OF THE SUB-COMMITTEE FOR CHEMICAL
AND PHARMACEUTICAL ARTS.

BY SIR BOVERTON REDWOOD, D.Sc. (Hon.), F.R.S.E.

The response to a circular letter issued to leading chemical manufacturers by the original Committee inviting participation in the St. Louis Exhibition was of so disappointing and discouraging a character that it was at this early period made evident that special inducements would need to be offered, and exceptional efforts made if success was to be achieved.

Immediately after the initial work of the Committee had been taken up by the Royal Commission, a sub-Committee, consisting of Sir Boverton Redwood (Chairman), Mr. A. Gordon Salamon, Mr. Thomas Tyrer, and Mr. Charles Wightman, with Mr. Edmund H. Lloyd as Secretary, was formed for the purpose of organising an exhibit which should be collectively representative of the Chemical and Pharmaceutical industries of this country.

The reluctance of manufacturers to undertake the labour and incur the expense of preparing exhibits and sending them to a distant country was not unnatural in view of the circumstance that the fiscal conditions in the United States precluded the hope of commensurate commercial benefit, and the Royal Commission, therefore, unquestionably acted wisely in offering special inducements to those invited to participate in collective exhibits, by undertaking to provide show-cases, to defray the cost of carriage of specimens, to instal the exhibits, to keep them in order, and to return them at the close of the Exhibition, for it is doubtful whether the efforts of the sub-Committee would not otherwise have been fruitless.

In most instances, however, the favourable responses received by the sub-Committee were the outcome of personal solicitation, and were inspired by a loyal and patriotic desire to contribute to the success of the British Section of the Exhibition, for which His Majesty the King had assumed responsibility by the appointment of a Royal Commission, and by the nomination of His Royal Highness the Prince of Wales as President.

The sub-Committee met regularly once a week, and often twice a week, from June, 1903, until the same month in the following year, the meetings usually lasting several hours, and throughout the greater part of this period there were few days on which correspondence and interviews incidental to the work of the sub-Committee did not require the personal attention of the Chairman. Every member of the sub-Committee also took individual action in securing promises of support from manufacturers and others.

At an early stage in their labours the sub-Committee were fortunate in being afforded the support and assistance of the Council of the Society of Chemical Industry, and the Chairman of the sub-Committee was permitted to make an appeal for co-operation to the members of the Society at the Annual General Meeting held at Bradford in July, 1903. The sub-Committee took full advantage of this opportunity of advocating the claims of the Exhibition to consideration, and much progress was made in enrolling exhibitors.

At the end of July the sub-Committee found themselves in the happy position of being able to report to the Liberal Arts Committee of the Royal Commission that they had obtained such promises of support from the leading representatives of the British chemical industries that the success of this branch of the Liberal Arts section was, in their opinion, assured. The sub-Committee appended to their report a classified list of exhibitors, and remarked that it would be seen therefrom that a thoroughly representative series of chemical and pharmaceutical products would be contributed by the principal manufacturers, adding that the high standing of the exhibitors might be regarded as affording a guarantee that the dignity and importance of these great industrial arts would be adequately upheld at the St. Louis Exhibition. At that date sixty-nine exhibits, in twenty-one subdivisions, had been definitely promised by forty-nine exhibitors, and negotiations were in active progress with thirty to forty additional firms. The sub-Committee therefore expressed the confident anticipation that the exhibits, as a whole, would compare not unfavourably with those of other countries.

Having thus indicated the measure of success which had so far attended their labours, the sub-Committee applied for, and were granted, the sum of £10,000 in respect of the expenses connected with the chemical exhibits.

At this time the sub-Committee realised that it would give exceptional distinction to the group of exhibits in which they were interested, and materially raise the level, if an exhibit illustrating the important part taken by illustrious British men of science in low temperature investigations, and embracing a practical demonstration of the remarkable achievements of Sir James Dewar in the liquefaction and solidification of hydrogen, and in the research work carried out by him in the laboratory of the Royal Institution in connection therewith, could be obtained. Sir James Dewar was accordingly approached on the subject by the Chairman of the sub-Committee, and agreed to give his assistance in carrying out the project.

The sub-Committee then sought and obtained the authority of Lord Peel and the other members of the Liberal Arts Committee to arrange on behalf of the Royal Commission for the purchase of a complete working plant, similar to that employed at the Royal Institution, to be constructed under the directions of Sir James Dewar. A grant of £2,500 was made to meet the expenses connected with the Low Temperature Exhibit.

During the following months the sub-Committee were actively engaged, with the valuable help of their Secretary, Mr. E. H. Lloyd, in the development of the undertaking, and to further assist them in matters of detail, they obtained the services of Mr. H. Werninck, who subsequently was placed on the official staff of the Royal Commission as one of the assistant superintendents of the Liberal Arts Section.

In January, 1904, the sub-Committee were enabled to report to Lord Peel, whose advice and sympathetic encouragement had been of the greatest service to them in the intervening period, that the arrangements already referred to had been carried out with even more complete success than they had ventured to anticipate. The number of exhibitors had been increased to one hundred, and the list included not only the principal chemical manufacturers, but also educational institutions and eminent men of science who had undertaken to contribute valuable specimens illustrative of research work. In addition, the loan had been obtained of several highly interesting collections of antiquities relating to pharmacy.

The sub-Committee decided, after careful consideration, that the majority of the collective exhibits should be displayed in a series of large octagonal show-cases, so constructed as to be

divisible by mirrored partitions into eighty separate sections, suitably fitted with staging covered with blue velvet, but some firms had two or more of these sections appropriated to them. In certain instances portions of the collective exhibits were arranged to be placed in separate rectangular cases, and some of the exhibitors, who furnished independent exhibits, had their own show-cases. The floor-space actually occupied by the British chemical exhibits in the Liberal Arts Building, it may be here mentioned, was 11,830 square feet, and the wall-space 460 square feet. The exhibits were, in accordance with instructions given by the sub-Committee, all staged in this country by the respective exhibitors in the manner in which they were intended to be shown in St. Louis, and were thus photographed. A full-sized model of a section of one of the octagonal cases, constructed by Mr. Charles T. Tyrer, at the request of the sub-Committee, was found most useful in connection with this work. In addition, detailed plans of every case, showing the exact position of each specimen, were prepared in order to facilitate the installation of the exhibits in St. Louis. The labour which this, and the subsequent installation involved, will be readily appreciated when it is stated that there were in all about eight thousand specimens to be dealt with.

In the same report the sub-Committee announced that the plant for the low-temperature exhibit had been completed by the contracting engineers, Messrs. Lennox, Benton & Reynolds, Limited, and was in course of being tested before shipment. On the recommendation of Sir James Dewar, Mr. J. E. Petavel, of the University, Manchester, was appointed Scientific Manager of this exhibit, with a view to his giving public demonstrations of the properties of matter at temperatures approaching the absolute zero during the period of the exhibition, and, at the same time, a competent engineer, who had been trained in the working of the plant, was engaged to act as assistant.

During the progress of their work, the sub-Committee recognised that in order to facilitate a systematic and critical study of exhibits of such comprehensive and highly technical character, especially by those not intimately acquainted with the manufactures represented, it was desirable to incorporate in the catalogue a series of descriptive accounts of some of the principal branches of the industry. Accordingly, arrangements were

made with Mr. G. R. Dunell to obtain information, by means of interviews, with leading exhibitors and technologists in Great Britain, and the particulars so furnished were embodied in a series of articles on the Alkali Industry (embracing Alkali, Sulphuric Acid, and Nitric Acid), Alum, Brimstone, Coal Tar Products, Cyanides and Prussiates, Electro-chemistry, Explosives, Nickel, Oils, Fats, Waxes, Soap and Candles, Pharmacy, Pigments and Paints, and Power Gas; the catalogue as issued being a volume of 181 pages. In their preface to this catalogue the sub-Committee remarked that a study of the contents could not fail to create astonishment at the widespread character of the exhibits, and to demonstrate that, notwithstanding the keenest competition, Great Britain still held her own in the chemical industries of the world. It is satisfactory to know that this view was subsequently endorsed by the awards of the International Jury, and that on the recommendation of Dr. Keiser, the distinguished Professor of Chemistry at the Washington University, the Descriptive Catalogue of the British Chemical Exhibits was adopted as a text-book for the use of advanced students of technology in that institution.

In thus announcing the establishment of a precedent by the successful organising of a thoroughly representative series of exhibits of British chemical industries, mainly on the collective principle, though without the suppression of individuality, the sub-Committee placed on record, in their report to the Liberal Arts Committee, their appreciation of the manner in which their efforts had been seconded by the leading manufacturers and others, without whose cordial and loyal support and active co-operation success would have been impossible. The sub-Committee further remarked that they considered it due to those who had thus given their valuable assistance to add that no such comprehensive and instructive exhibit of the industries in question had been contributed by this country to any previous exhibition abroad. This opinion also received the fullest confirmation.

Early in the year 1904, the shipment of the chemical specimens was commenced, and shortly afterwards the sub-Committee were fortunate in being able to arrange with Mr. Charles T. Tyrer to personally supervise the unpacking and installation of the exhibits, the number of which had been

increased to 125. The usual delays in transport and delivery occurred, and the exceptionally troublesome Customs formalities were the cause of much further loss of time, but through the unremitting exertions of Mr. C. T. Tyrer the British Chemical Section was ready for the reception of visitors on the opening day. The successful overcoming of the difficulties alluded to was largely due to the judicious action of the British Commissioner-General, whilst Mr. Lloyd also rendered valuable assistance.

For the installation of the Low Temperature exhibit a special building, with a floor-area of 450 square feet, was erected, and some delay occurred before the necessary supply of electrical power was obtained. From the time, however, that the plant was put into operation there was not throughout the whole period of the Exhibition the slightest interruption of the working, and it was at no time necessary to postpone the commencement of a demonstration or to stop before the advertised time. Having regard to the highly complicated character of the apparatus, and to the extreme difficulty of much of the work, especially under the trying climatic conditions prevailing in St. Louis during the summer months, this result reflects the greatest credit upon Mr. Petavel and his assistant. Twice a week the building was thrown open to the public, and the machinery shown in action, the liquid air collected during this time being used for a continuous series of popular experiments. These occasions afforded an opportunity to those interested in engineering to examine the construction of the compressors and liquefiers. The manufacture of liquid hydrogen was carried on twice a week, but owing to this operation being not altogether free from danger the audience was limited on these occasions to a few scientific men specially interested in the subject.

In connection with this exhibit the sub-Committee arranged that Mr. Petavel should give during the course of the Exhibition a series of lectures and experimental demonstrations, the following being some of the principal subjects dealt with:—

1. Historical Review. Classical researches of Faraday, Joule, and Thomson.
2. Historical Review. Modern researches (Sir James Dewar and others).

3. The production of low temperatures. Methods and apparatus.

4. Effect of low temperatures on the physical properties of matter.

5. Effect of low temperatures on chemical reactions.

6. Electric and magnetic properties at low temperatures.

7. Liquid hydrogen.

8. Uses of liquid gases in the laboratory.

Some eighty of these lectures and demonstrations were given, and this feature of the exhibition proved to be as attractive as it was novel. To satisfy, as far as possible, all sections of the audience, the time of each lecture was divided into two parts. During the first half-hour a number of experiments were performed, which were made the theme of a short exposition of the results obtained. This was worded in such a manner as to be easily understood by those having no previous technical education. The second half-hour was occupied by a scientific lecture, dealing on each occasion with some new branch of the subject. The lectures were illustrated by diagrams and lantern-slides, in addition to experiments.

On the occasions of the visits of various scientific bodies special subjects were treated, such as :—

1. Engineering problems connected with the manufacture of liquid gases.

2. The cryogenic laboratories throughout the world.

3. The limit of temperature.

The wide scope of the exhibit made it possible to introduce considerable variety into the lectures, and although the same titles recurred more than once, the matter was treated in a somewhat different fashion, new facts being brought forward and other experiments made.

Thus, during the whole period of the Exhibition, a lecture was never repeated, the object always in view being to make each discourse as far as possible complete in itself, whilst keeping a connecting thread running through the entire series. Some such plan was rendered necessary by the circumstance that, though the greater part of each audience was only present on one occasion, some members returned repeatedly, and a few followed all lectures for a period of a month or more.

Only the quantity of liquid hydrogen required for the lectures was prepared, usually about one to two litres, at each operation. On the few occasions, however, when much larger quantities were required, the desired amount was obtained without difficulty, the plant having a yield far in excess of the output capacity of any previously-constructed apparatus.

Whilst the plant was in operation, various offers were received from persons desirous of making use of the liquid gases, or of the exceptionally pure hydrogen which was being manufactured. In view, however, of the strictly scientific nature of the exhibit, it was considered inadvisable to accept such offers.

When the plant was not in active operation, the time of the staff was more than fully occupied by the constant work of testing and adjusting the various parts of the machinery. The greater part of the apparatus had to withstand a gaseous pressure of 3,000 lbs. per square inch, and in the case of the hydrogen circuit any leakage of air inwards, or of gas outwards, would instantly have led to a disastrous explosion. Constant vigilance was therefore necessary, all high-pressure parts being tested at intervals to twice the working pressure. It is to these precautions, and to the good construction of the machinery, that the happy circumstance that during the entire period not a single accident occurred must be attributed.

The value of the exhibit was recognised by the International Jury by the grant in respect of it to the Royal Commission of the highest award, viz., a Grand Prize, whilst, in addition, Sir James Dewar was awarded a Gold Medal, and Mr. Petavel a Silver Medal.

There were also numerous favourable expressions of opinion, both from scientific men and from the general public. At the close of the Exhibition the plant, which will be found fully described in the catalogue of the British Chemical Section, was purchased from the Royal Commission by the Bureau of Standards of the United States Government, and is now installed at Washington. A new and somewhat daring departure from exhibition practice has thus been completely justified, and this country may be congratulated on having contributed to the St. Louis Exhibition a unique feature which, by common consent, gave exceptional distinction to the British chemical exhibits. For the success of this innovation the Royal Commission are indebted in particular to Mr. Petavel, through

whose conspicuous ability the many difficulties incidental to such work were overcome.

In respect of chemical exhibits it is more than ordinarily important that effective means should be adopted to bring the merits of the exhibits to the notice of the Jury, and in this matter Great Britain has at previous Exhibitions allowed herself to be placed at a disadvantage in comparison with other nations.

Accordingly, early in 1904, the sub-Committee addressed a circular letter to the Exhibitors pointing this out, and requesting to be furnished with statements indicating those features of the respective exhibits which were specially worthy of attention, with a view to such particulars being supplied to the British members of the International Jury. The information thus obtained, together with that given by the descriptive Official Catalogue of the British Chemical Section, fully met the requirements, and supplied the British representatives with the means of enlightening their colleagues. To this provision the number and character of the awards was primarily in large measure doubtless due, but the object in view could not have been as effectively achieved if this country had not been able to obtain the services as Jurors in this section of two representatives as highly qualified for the posts as Mr. H. J. Helm and Mr. Walter F. Reid. To Mr. Reid in particular as a member also of the Superior Jury, the thanks of the exhibitors are due, but this gentleman has himself placed on record his sense of the high value of the services rendered by his colleague. Through the instrumentality of these representatives, the merits of the British chemical exhibits were effectively presented to the Jury, with the highly satisfactory results indicated by the following awards to exhibitors and collaborators :—

16 Grand Prizes ;
32 Gold Medals ;
28 Silver Medals ;
24 Bronze Medals.

In their report to the Royal Commission, the British Jurors for Group 23 (Chemical and Pharmaceutical Arts) state that the exhibits were compactly and effectively displayed, and that this added largely to their educational value, as well as to the favourable effect produced on visitors to the Exhibition. They

add that they were informed that many visitors, especially pharmaceutical chemists, medical men, and members of scientific societies, expressed their admiration and surprise at the nature and extent of the exhibits, which had done much to dispel the illusion that Great Britain's chemical manufactures were in a decadent state. The Jurors further observe that the practical working of the Low Temperature exhibit, and the lectures by Mr. J. E. Petavel, were well attended and much appreciated. A special demonstration of the preparation of liquid and solid hydrogen was given for the Jury, and was so successful that more liquid hydrogen was made on that day than at any previous demonstration, though the time that the Jury could give to it was necessarily very limited. The American members of the Jury considered it as a great compliment to their nation that the British Commission should have gone to the great expense and trouble of providing such lectures and demonstrations, and declared the exhibit to be the finest in the whole Exhibition.

Before concluding their report, the sub-Committee desire to express their appreciation of the value of the services of Sir Isidore Spielmann, as Honorary Assistant Secretary, in facilitating the settlement of many questions which arose in connection with the chemical exhibits after the departure of the British Commissioner-General for St. Louis.

Finally, the sub-Committee have the great satisfaction of recording that the total expenses incidental to the British chemical exhibits, including the Low Temperature Exhibit, Lectures and Demonstrations, are £2,312 16s. 9d. less than the sum granted.

BOVERTON REDWOOD,

Chairman of the sub-Committee.

REPORT ON THE EXHIBIT OF CIVIL ENGINEERING.

BY L. F. VERNON-HARCOURT, ESQ., M.A., M. INST. C.E.

The British Civil Engineering Exhibits shown in the St. Louis Universal Exhibition pertained for the most part to Group 26, relating to public works; and as the Chief of the Liberal Arts Department, Colonel J. A. Ockerson, had expressed a special desire that models should form part of these exhibits, an interesting collection of engineering models was eventually obtained by means, in most instances, of direct personal solicitations, and constituted a prominent feature in these engineering exhibits. A short explanatory introduction preceded the list of engineering exhibits given in the British Catalogue, published in time for the opening of the Exhibition; whilst the present report furnishes concise descriptions of the exhibits as actually displayed at St. Louis, and the very important public works represented by them, classified under the different branches of Civil Engineering to which they belong, and with regard to which the International Juries at St. Louis clearly signified their sense of the conspicuous merit evinced, by the awards, in many instances of a high class, they conferred upon most of the British Engineering Exhibitors. The exhibits, moreover, were not confined to the British Isles, but included irrigation and dock works in India, and the Assuan Dam in Egypt; and for convenience of grouping the descriptions, and owing to their intimate connection with Great Britain, the Colombo Harbour Works, and the models of the Irrigation works exhibited by the Egyptian Government, have been included in this Report. It is gratifying to record that our exertions were rewarded by a display of Civil Engineering Exhibits at St. Louis, manifesting a very notable advance, in the representation of the magnitude and extent of modern British Public Works, on those shown in the preceding Universal Exhibition, held at Paris in 1900.

MARITIME WORKS.

Lighthouses.—The history and progress of lighthouse construction was admirably exemplified by models, lent by the

Trinity House, of the four lighthouses successively erected on the Eddystone rocks, namely, Winstanley's, constructed of wood, and resembling a Chinese pagoda in appearance with projecting balconies and ornamentation, completed in 1698, and washed away during a storm in 1703; Rudyerd's, a conical wooden structure built round a solid stone core at the base, 24 feet in diameter at the bottom, and 92 feet high, from which a light of 24 candles was first exhibited in 1708, and which was destroyed by fire in 1755; Smeaton's lighthouse of stone, completed in 1759, from which a light of 67 candle-power, given by 24 wax candles, was at first exhibited, at a height of 72 feet above high water, subsequently increased by oil lamps and an optical apparatus, to a beam of 6,850 candles; and, lastly, the present Eddystone Lighthouse, designed by Sir James Douglass, and put into service in 1882, which emits flashes of 79,000 candle-power at a height of 133 feet above high water. The progress in this branch of engineering was further illustrated by models of the first Smalls Lighthouse erected on oak piles in 1776, and the present stone tower, which first exhibited its light of 9,500 candle-power in 1861, at an elevation of 125 feet above high water; by models of the first lightship moored at the Nore in 1732, and the present type of lightship adopted by the Trinity House; and by the contrast offered by the first form of facet reflector used in lighthouses, invented in 1763, and the present 21-inch reflector. The Commissioners of Irish Lights also contributed to this branch of exhibits by a model of a lightship built in 1901, the first vessel used by them on which a fixed lamp was fitted, exhibiting a light with its focal plane 38 feet above the water-line; and by a model of the steamer specially designed, and built in 1898, for conveying and landing the large granite stones used in the construction of the new lighthouse on the Fastnet Rock, off the southernmost point of Ireland, and fully open to the Atlantic.

British and Colonial Harbours.—Harbour works were well represented by a large model of the Sunderland docks and harbour, covering an area of 220 acres reclaimed from the sea, and especially by the breakwaters, approaching completion, extending out into the sea on each side of the River Wear, for affording a deep-water entrance and sheltering the access to the river and the docks, shown in plan on the model, and also in section by another model on which a model of a revolving block-setting crane was

placed, employed for depositing the 43- to 52-ton concrete blocks, faced with rubble granite, on the outer faces of the breakwater, and also the concrete-in-mass between them from skips, on the top of the mound of 56- to 116-ton concrete bags raised from the bottom up to above low water. Other models exhibited by the River Wear Commissioners in connection with these harbour works comprised a model of a sand-pump hopper dredger, capable of raising and depositing in its hopper 650 tons of sand in 45 minutes, used for removing the sand overlying the rock-bottom before laying the foundation concrete bags for the breakwaters; a model of the twin-screw, steam, hopper barge for depositing the concrete-in-bags under water; and the model of a bucket-ladder dredger, lifting 600 tons of loose rock per hour in deepening the harbour, and depositing it into 400-ton iron and steel hopper barges, one of which was shown by a model alongside the model of the dredger. The northern, completed breakwater is 2,800 feet long, and the southern breakwater, in progress, is designed to have a length of 2,844 feet; and it is anticipated that on the completion of the works there will be a depth at the entrance of the harbour of about 25 feet at low water of spring tides, giving a depth of 40 feet at high water. A granite lighthouse on the northern pierhead, which is reached in stormy weather through a subway in the breakwater, gives flashes of only one-tenth of a second duration, having an intensity of 150,000 candles, which can be seen 15 miles off; and a fog siren, worked by compressed air, has a similar range.

A capital model of Colombo Harbour, showing the breakwaters sheltering the harbour, which are approaching completion, was exhibited by the Ceylon Government in the Liberal Arts Building. The first work carried out was the south-west breakwater, commenced in 1875, extending from a projecting point of land in a northerly direction for a length of 4,210 feet, which sheltered a water-area of 400 acres, with a depth of 30 feet at low water, from the south-west monsoon which raises much the worst seas in that locality; and this breakwater was completed in 1885, at a cost of £700,000. As it was found that some swell came into the harbour, which was quite open to the north, during the prevalence of the north-east monsoon, it was proposed to increase the shelter of the harbour by a north-east breakwater at the northern end; but owing to the increasing trade, it was eventually determined to combine improved shelter from the

north with an extension of the harbour. This extension, commenced in 1894, consists of a north-west breakwater, 2,670 feet long, running in a north-easterly direction, in a line for the most part with the outer portion of the south-west breakwater, but leaving an entrance between them 800 feet in width, and a north-east breakwater, 1,000 feet in length, running out from the shore towards the north-eastern extremity of the north-west breakwater, between which a second entrance, 700 feet wide, is left, giving a choice of approach for vessels according to the weather. The sheltered water-area of the harbour at low tide has been increased by these works to 660 acres; the entrances are situated in depths of between 30 and 40 feet at low water; and a considerable portion of the harbour affords depths of from 4 to 6 fathoms. The breakwaters for the extension, together with a repairing slip, a coaling depot of 24 acres on land reclaimed from the foreshore in the harbour, and dredging for extending deep water inside, involve an expenditure of £842,130; whilst the estimated cost of a graving dock in progress, having a length on the floor of 700 feet, a depth over the sill of 30 feet at low water, and an entrance width of 80 feet, is £346,700.

The progress achieved in recent years in the manufacture of plant for setting large concrete blocks for the construction of breakwaters, which has so materially aided the formation of harbours, was very well indicated by the model of the 50-ton revolving block-setting Titan, built by Messrs. Stothert & Pitt for constructing the breakwater in progress at Peterhead, for forming a harbour of refuge on the exposed east coast of Scotland. Photographs, also, furnished other interesting examples of similar plant of varied type.

Protective Sea Works.—This branch of maritime engineering was represented by a model of the reclamation embankment, carried out in front of Leith Harbour for the extension of the Port, consisting of a mound of packed rubble stone, protected on the sea slope by a facing of concrete blocks, within the shelter of which docks have been constructed.

The sea wall and marine drive in course of construction round the promontory of Castle Hill, Scarborough, which is designed to connect the North and South Bays, hitherto separated by the projecting headland, were illustrated by a series of photographs, giving views of the bays and works.

Two models of the sea wall protecting the esplanade in front of Hove showed the form adopted for the wall, and the modes of access to the beach by an incline and by steps.

BRITISH AND INDIAN DOCK WORKS.

English Docks.—An extensive exhibit of this class of work in England was furnished by a fine panoramic view in water-colours of the long range of Liverpool Docks, extending about six miles along the Mersey, with numerous photographs of some of their most interesting features, including the Birkenhead Docks; by a plan of the Tilbury Docks with sections of the works, the latest, deepest, and best arranged of the docks on the Thames; by the model of Sunderland Harbour and Port already referred to, showing the docks; by a model of Southampton Docks and deep-water Quays, a port which has attained a very prominent position since its development by the South-Western Railway; and a sketch of the Barry Docks, which, though the most recent of the South Wales Ports, have already acquired a large share of the trade of that locality.

Port of Dublin.—Ireland was also well represented by charts showing the gradual improvement of the access to the Port of Dublin, and in the depth of the River Liffey, with a further increase projected, and plans indicating the development of the docks and quays; whilst a series of photographs illustrated some of the special features of the port. The most interesting portion, however, of this exhibit was the set of drawings of the plant by which deep-water quays were formed, up to low water, by 360-ton rubble-concrete blocks, built on shore, and floated out and deposited in place on the bottom levelled by a diving-bell. By these works, steamers are able to get up alongside quays in the River Liffey at any state of the tide.

Port of Bombay.—India, moreover, had an important share in this exhibit, by plans of the existing docks at Bombay, its principal port, and of the large extensions in progress and projected, and a general chart of the harbour.

NAVIGATION WORKS.

River Clyde Navigation Improvement.—The very remarkable development of the River Clyde effected within the last 150 years, mainly by dredging, but also, to some extent, by jetties, training works, and regulating quays, thereby converting an

insignificant stream, fordable in places at low tide, into a deep, navigable river, accessible by vessels of the largest class at high water, and affording a depth of $22\frac{1}{2}$ feet at low water of ordinary spring tides, was clearly exhibited by a longitudinal section of the river from Glasgow weir down to Greenock, showing the depth of the river at certain periods from 1758 down to 1902. The present state, also, of the river and Glasgow Harbour, was indicated by large plans; whilst numerous photographs showed the method of the construction of the walls of the Queen's Dock and Prince's Dock, of the reconstructed river quays of Glasgow Harbour, some graving docks, general views of the harbour and docks, illustrations of the equipment of the quays and docks, of typical portions of the dredging plant, and of the light-towers, lighthouse, and lightship for directing the navigation of the river by night.

A model of the elevating-deck Ferry Steamer "Finniester" was also exhibited, which enables vehicles and passengers to cross the River Clyde, and to embark and disembark on a level with the roads, on each side, at any state of the tide; and photographs were also shown of this ferry steamer, of the Govan vehicular ferry-boat for crossing the river, and of the steamer "Clutha" for conveying passengers up and down the harbour.

The tidal weir across the River Clyde above Glasgow, completed in 1901, which was erected in order to prevent the erosion of the banks of the river above by the tidal currents, the exposure of mud flats at low water, and impediments to boating, resulting from the removal of a previous weir in 1881, giving free admission to the tide higher up, was clearly indicated by a working model, exhibited by Messrs. Ransomes and Rapier, with a view of showing the action of the sluice-gates sliding, according to the Stoney system, on free rollers, thereby greatly reducing the friction of the gates in being raised against a head of water. The gates on approaching the top of their course are automatically turned by the aid of curved grooves at the sides of the piers, so as to assume a flat position, and thus avoid obstructing the view, on the principle first adopted at the Richmond weir across the Thames, where the sluice-gates, on being raised, are hidden in a recess between the double arches of the footbridge. The Clyde weir has three openings of 80 feet span, each closed by a sluice-gate 12 feet high, which can be raised 31 feet; and

the model showed the sluice-gate shut down in one opening, partially raised in the second, and fully raised at the third.

Transverse Grand Junction Canal Incline at Foxton.—The canal incline constructed about four years ago at Foxton in Leicestershire, illustrated by a plan, section, and photographs, has taken the place of a flight of ten locks, for surmounting a difference in level of $75\frac{1}{6}$ feet between two reaches on the Leicester section of the Grand Junction Canal. The flight of locks at Foxton could only admit one 33-ton barge at a time, which occupied 75 minutes in passing through, with an expenditure of 4,800 cubic feet of water; whereas the incline of 1 in 4, on which two counterbalancing caissons travel transversely, in a horizontal position, on wheels, each capable of accommodating two 33-ton barges, or one barge holding 70 tons, allows of the passage of two 33-ton barges in each direction in 12 minutes, with hardly any expenditure of water.

Channel Passage for Trains (proposed).—A model of a twin-screw Channel Steamer with a moveable platform, exhibited by Messrs. Simons, showed an interesting scheme for the extension of the principle which they had adopted in constructing the Ferry Steamer "Finnioston," to the conveyance of trains on steamers across the English Channel, so constructed with an elevating deck, that the trains could be run from the quay on to the adjusted deck, and off the deck on to the quay on arriving at the other side, at any state of the tide.

DREDGERS AND ROCK-CUTTERS.

Dredgers.—Three representative models of different types of dredgers were exhibited by Messrs. Simons, of Renfrew; one, of the bucket-ladder, bow-well dredger "Lyster," loading into barges, capable of dredging to a depth of 45 feet below the water-line, employed at the Mersey docks; another, of the bucket and pump, sternwell, hopper dredger "Percy Sanderson," with a hopper capacity of 1,250 tons, working on the bar at the Sulina mouth of the Danube; and the third, of the sand-pump hopper dredger "Grampus," furnished with two 33-inch centrifugal pumps able to raise 3,000 tons of sand per hour through a single suction pump, 42 inches in diameter, from a depth of 35 feet, and whose hopper has a capacity of 1,200 tons, which is being used for lowering the bar at the entrance to Durban, the Port of Natal. This exhibit was supplemented by photographs

of twin-screw, bucket ladder and suction hopper dredgers, 1,200-ton, twin-screw, hopper barges, and a paddle ferry steamer for crossing the Thames.

Photographs, also, of gold, sand-pump, and other dredgers, a sternwell steamer for shallow channels, a steam tug, and some steamships for Japan were exhibited by Messrs. Lobnitz, of Renfrew.

Rock-cutters.—The method of excavating rock under water by first breaking it up by successive blows of a long, steel-pointed bar or ram, weighing from 4 up to 13 tons, let fall upon the rock from a staging on a barge, was illustrated by a model of a double 13-ton rock-cutter mounted on a special vessel, built by Messrs. Lobnitz, who inaugurated the system, for widening and deepening the Suez Canal through rocky strata, and by photographs of rock-cutters alone, and also mounted on a barge. The heaviest rock-cutters, dealing between 35 and 100 blows an hour, break up about 2 cubic feet, on the average, per blow, the effect of the blow necessarily varying largely with the nature of the rock; and the system has proved very serviceable in the enlargement of the Suez Canal through the rock cuttings, and in the removal of the obstructive, rocky shoal in the Danube, known as the "Iron Gates."

INDIAN AND EGYPTIAN IRRIGATION WORKS.

Indian Irrigation Works.—Very extensive sets of plans and photographs were supplied by the Public Works Department of India, of some of the canals and subsidiary irrigation works designed, carried out, regulated, and maintained by the engineers of that Department, which have conferred such great benefits on the cultivation of the arid districts of India, and have proved so valuable in diminishing the disastrous effects of famines, resulting from the periodical occurrence of droughts in certain districts. The plans exhibited comprised works on the Orissa Canals; various works on the Midnapore Canal, including headworks, Midnapore weir with details, works on distributaries, a tidal lock at Ulabarua on the Hugli, and an aqueduct; the Sone weir with details, locks, a regulator, and the undersluices and walls of the Sone anicut, in connection with the Sone Canals; the anicut and headworks of the Godaveri delta system, with numerous details; and albums of plans of the Bari Doab, Sirhind, Western Jumna, and Sidhnai Canals. The photographs

furnished views of the Cauvery-Vennar regulators, the grand anicut as seen from them, the lower anicut, and the lift shutters on these anicuts, the Kistna in flood, and various other irrigation works; and, lastly, albums of views of the Upper and Lower Ganges Canals, the Agra, Eastern Jumna, and Betwa Canals, and of the new Nadral Aqueduct.

Egyptian Irrigation Works.—A model of the Assuan Dam, made expressly for the Exhibition by Sir John Aird, Bart., represented the most notable recent work carried out in Egypt, of the utmost importance for securing an adequate supply of water for summer irrigation, by damming up the Nile towards the close of the floods, and thereby forming a reservoir extending 140 miles up the valley, and storing up nearly 1,300 million cubic yards of water, which is used for supplementing the flow of the river during Low Nile, to ensure perennial irrigation for Upper Egypt. The dam stretches across the Nile at the First Cataract at Assuan, for a length of about $1\frac{1}{4}$ miles; and though it is exceeded in height by several other masonry reservoir dams, it possesses the unique peculiarity, in addition to its great length, of having to pass the entire flood discharge of one of the largest rivers in the world through it, by means of 180 sluice openings formed in it, for the most part 23 feet high and $6\frac{1}{2}$ feet wide. These openings are closed by sluice-gates when the water has to be impounded in the reservoir formed by the river valley above the dam; and the 130 sluice-gates used for regulating the water in the reservoir, or for emptying it, and, consequently, liable to have to be raised against a considerable head of water, are provided with free rollers at each side, by sliding on which they are readily lifted. Photographs showed various stages of the work; the Nile flood of 1901 flowing over the unfinished dam; and, lastly, the reservoir filling, the water pouring through the sluice-ways, and the opening ceremony on the 10th of December, 1902.

A set of photographs illustrated the sluice-gates for closing the openings in the Assuan Dam, when the reservoir is being filled, and also the five lock-gates across the flight of four locks placed in the side channel on the left bank of the river at the extremity of the dam, to enable vessels navigating the river to surmount the difference in level of the river below and above the dam, which works were constructed by Messrs. Ransomes & Rapier. Each of the lock-gates, varying in height between

59 feet and $26\frac{1}{4}$ feet, consists of a single leaf stretching across the lock, which is $31\frac{1}{6}$ feet wide, suspended from two rows of free rollers carried by two bascule girders spanning the lock, which are raised for the passage of vessels as soon as the lock-gates have been rolled back into a recess in the side wall for opening the lock.

A very interesting collection of models of Egyptian Irrigation Works was exhibited in the Egyptian Section in the Liberal Arts Building, which, though quite distinct from the British exhibits, may advantageously be referred to here. The Daira Sanieh Administration exhibited a large model of a tract of country in relief, showing very clearly the arrangement of the irrigation canals in Upper Egypt, with water flowing through them, and the manner in which the water is distributed over the land. The Public Works Department of the Egyptian Government exhibited a model of the Delta Barrage in construction, of the irrigation works connected with this barrage, various models of old native methods of irrigation, and a large panoramic photograph of the Assuan Dam, thereby, in conjunction with the large first-mentioned model, presenting a kind of history of irrigation, as practised from a remote period, in a country which depends wholly on irrigation for its existence.

MUNICIPAL WORKS.

The various branches of engineering works carried out by large municipalities were very well represented by typical examples of waterworks, sewage purification, communications across rivers, paving and maintenance of streets, sanitary dwellings, and fever hospitals.

Water-Supply of the City of Birmingham.—The works in progress for providing Birmingham with an ample supply of the purest water, collected from an uninhabited mountainous district, were capitally illustrated by a relief model of the watershed of the rivers Elan and Claerwen in South Wales, showing the reservoirs already constructed by dams across the valley of the River Elan, and also those proposed in the future; by a plan of the watershed, aqueduct, and district of supply; a longitudinal section of the aqueduct; and photographs of the principal works carried out, and in progress, for obtaining and delivering the supply. Under the complete scheme, Birmingham will receive a supply of 75 million gallons a day, which, together with 27

million gallons a day of compensation water to the rivers, drawn from a catchment area of 45,560 acres, with a storage capacity, to maintain the supply through long droughts, of 18,000 million gallons when the six reservoirs shall have been completed by the erection of masonry dams across narrow parts of the valleys, ranging in height from 98 to 128 feet above the river-bed. The aqueduct from the lowest reservoir in the Elan valley to Birmingham, nearly 74 miles long, is carried for about half its length in tunnel and covered conduit along the hydraulic gradient of 1 in 4,000, constructed of adequate dimensions to discharge the full supply of 75 million gallons a day; and the remainder consists at present of two lines of 42-inch metal pipes, to be increased eventually to six lines for conveying the full supply, with a fall of 1 in 1,760. The longest tunnel on the aqueduct is $4\frac{1}{4}$ miles in length, the longest siphon 17 miles, and the maximum dip of the pipes below the hydraulic gradient is 550 feet, in crossing the River Severn near Bewdley, the pipes being carried on bridges across the rivers.

The supply and gathering ground thus secured for Birmingham are much larger than in any other similar work hitherto constructed in England.

Water-Supply of the City of Manchester from Thirlmere.—Another interesting method of procuring a large supply of the purest water from a mountainous district for a large City 100 miles distant, was illustrated by the Water-works Department of the Manchester Corporation, of the works carried out for storing up water for the supply of Manchester, by raising the level of Thirlmere 50 feet by a concrete dam across its outlet, on a map showing the watershed of the lake, the extent of the original and raised lake, and the line of aqueduct from the lake for conveying the water to Manchester, and by photographs of the impounding concrete dam. When the requirements of Manchester necessitate the raising of the water-level of the lake to its full height, the storage of 8,130 million gallons thus provided will ensure the delivery of 50 million gallons of water per day to Manchester, together with $5\frac{1}{2}$ million gallons daily of compensation to the issuing stream.

Sewage Purification Works of Manchester.—The new works for the bacteriological treatment of the Manchester sewage were shown on a general plan indicating the arrangements adopted; whilst the results obtained by the new contact beds, in relation

to the purification of the effluent, were indicated by diagrams; and a history of the works was given in a pamphlet, accompanied by views of the works, diagrams, drawings, and a general plan showing the position of the bacterial beds, the storm-water filters, and the lands to be irrigated by the effluent.

The stoppage of the pollution of the rivers Irwell and Mersey by the sewage of Manchester acquired enhanced importance after the construction of the Manchester Ship-Canal, which has intercepted the waters of these rivers. Accordingly, in 1894, the system of chemical precipitation of the sewage by treatment with lime and iron sulphate in tanks was adopted, after the coarser floating substances and heavy detritus had been removed by screens and catchpits. The flocculent precipitate thus formed settled at the bottom of the tanks, eleven in number, carrying down with it the finer and lighter matters in suspension; and the sludge thereby deposited was forced through channels to two ejectors, which, by means of compressed air, delivered it into two storage tanks adjoining the Ship-canal, from which it was discharged by gravity into the sludge steamer, which conveyed it out to sea, and deposited it in deep water beyond the Mersey bar; whilst the clarified liquid in the precipitating tanks was discharged into the Ship-canal. As, however, this effluent still contained a large quantity of putrefying organic matter, the Canal remained in a very polluted and unsatisfactory condition; and, consequently, bacterial treatment of the sewage was determined upon in 1900, and was first experimented on early in 1901, with two half-acre contact beds, which having given thoroughly satisfactory results, have been since extended with a view of treating the whole of the sewage bacterially.

The complete design for dealing with a maximum flow of sewage of 126 million gallons in 24 hours, comprises five new tanks to serve as septic tanks, making in all sixteen tanks, each 300 feet long and 100 feet wide, four of which are reserved for the deposit of detritus from the storm waters; 92 half-acre first contact bacterial beds, from which the treated sewage is led by an open conduit to a second set of 92 half-acre second contact bacterial beds, about $2\frac{1}{2}$ miles distant; and the resulting effluent is distributed over about 100 acres of adjacent land, before being discharged into the Ship-canal. Half the maximum flow of sewage provided for, namely 63 million gallons, is

treated in this manner; but any excess, up to the additional 63 million gallons, is discharged on to 26 acres of storm-water filter-beds adjoining the first set of bacterial beds near Barton Locks; and any excess in times of heavy rain over the 126 million gallons, is discharged direct into the Ship-canal at the Mode Wheel storm-water overflow near the upper end of the Canal. The cost of these works has been estimated at about £487,300.

Road Connections across the River Thames near London.—The new roadway bridge over the River Thames at Kew, opened by the King on the 20th of May, 1903, after $3\frac{1}{2}$ years had been spent in its erection, for improving the means of communication, and providing for the great increase in traffic of the growing population of the districts on both sides of the river, was well illustrated by a model of the bridge, lent by the County Councils of Middlesex and Surrey, who shared the cost of its construction. The bridge crosses the river with three elliptical arches, the central one having a span of 133 feet, and a headway of 20 feet above Trinity High Water, and the two side arches each $116\frac{1}{2}$ feet span, with a headway of 17 feet; and the two river piers are 18 feet thick at the springings of the arches, increasing to 38 feet at the foundations, formed of cement concrete laid on the London Clay, 18 feet below the bed of the river. The bridge is 502 feet long, with approaches of 270 feet, and 410 feet, on the Middlesex and Surrey sides respectively, having a gradient of 1 in 40, and carries a roadway 36 feet wide, with footways on either side $9\frac{1}{2}$ feet wide, which are increased to 11 feet along the approaches. The arches, which were erected simultaneously on iron centering to distribute the load uniformly on the foundations, and to maintain the necessary headway for navigation during their construction, were built of granite; and all the facework of the bridge has been formed of granite, which gives the bridge a solid and handsome appearance.

A model of the shield employed in the construction of the Blackwall Tunnel under the bed of the River Thames, exhibited by the London County Council, showed clearly the method by which circular tunnels, formed of a series of cast-iron rings composed of segments bolted together, can be carried through water-bearing strata by the aid of compressed air, thereby affording a subterranean means of providing communication

between the two sides of a river, where the erection of a fixed bridge over a river is precluded by the headway which would have to be given for the passage of ocean-going vessels, involving long approaches over low-lying land, and where an opening bridge would be inconvenient for the traffic, and objectionable with its piers across a very crowded tidal river. The shield was employed for the central 3,112 feet of tunnel, of which 1,220 feet were under the river, the total length of the work, including the approaches, being 6,200 feet; and at one place, where the shield was only separated from the bottom of the river by a thickness of 5 feet of coarse gravel, a layer of clay had to be temporarily deposited on the bed of the river, with a maximum thickness of 10 feet, to prevent the compressed air in the tube escaping sufficiently to force up the thin stratum of gravel, and thereby form a passage for the water to rush into the tunnel from the river. The cylindrical steel shield was $19\frac{1}{2}$ feet long in the line of the tunnel, and $27\frac{2}{3}$ feet outside diameter; and its forward portion was stiffened, and divided at the working face into four floors and twelve compartments, by three horizontal, and three vertical plate diaphragms. Small openings in the front cross diaphragm, giving access to the working face from the several compartments, which could be closed by doors when necessary, enabled the excavation to be carried forward; and the shield was made to follow the excavation by 28 to 36 hydraulic rams. As the shield was pushed forward, the rings forming the tube, with an external diameter of 27 feet, $2\frac{1}{2}$ feet wide, and composed of fourteen segments and a key, were successively put in place by two revolving erectors lifting each segment, under shelter of the clear rear part of the shield, which was long enough to overlap the last completed ring when the succeeding ring was being erected. A roadway, 16 feet wide, has been formed through the tunnel, with a 3-feet footway on each side; and an arched subway between the road and the bottom of the tube, affords an ample provision for pipes. The cost of construction of the subaqueous portion of the tunnel, by means of the shield, amounted to £550 per lineal yard; and the total cost of the work was £871,000.

Street Paving and Maintenance.—Drawings of various formations of roads as adopted in Westminster, with photographs of municipal works and appliances there, with regard to the cleansing and maintenance of the streets, were exhibited by the

Westminster City Council. A set of drawings giving cross sections of streets, laid with macadam, and paved with Karri wood blocks, a plan of Birmingham showing the roads, sewers, and building sites, a new road bridge, and various details relating to roads and tramways in the City, were exhibited by the Birmingham Corporation.

The Highways Department of the Manchester Corporation, also, exhibited a drawing of cross sections of their streets showing the methods of construction, and another drawing indicating typical sections of their sewers.

Sanitary Buildings.—The newest types of labourers' dwellings, built with special regard to sanitary conditions, were shown by plans, elevations, and sections, and in a perspective view, by the Liverpool Corporation; and the Sanitary Department of the Glasgow Corporation exhibited a model of the Ruchill Fever Hospital erected by them in Fossilpark, Glasgow, together with a plan and section of the sanitary wash-house attached to it, and photographs of the appliances used for disinfection.

MILITARY ARCHITECTURAL ENGINEERING.

Through the kindness of the War Office, several typical barracks in different parts of the world were exhibited. The series comprised twelve standard plans of barrack buildings, plans of Infantry and Royal Horse Artillery barracks at Aldershot, and Cavalry barracks at Shorncliffe, and a perspective sketch of the Millbank Military Hospital; whilst the Military Hospital at Gibraltar, and barracks at Malta, Egypt, Hong Kong, and Wei-Hai-Wei, were shown by photographs.

L. F. VERNON-HARCOURT.

REPORT OF THE MANUFACTURES COMMITTEE.

BY THE RIGHT HON. LORD CASTLETOWN, C.M.G.

The Royal Commission, at their meeting at Marlborough House on April 28th, 1903, nominated five members of the Commission to act as a Committee for the purpose of organising exhibits in the Department of Manufactures; and as the classification under this Department extended over so varied a range of manufactures, it was determined to invite certain gentlemen, who had special knowledge in the different branches, to join the Committee, and in this manner six gentlemen were added to the Committee whose advice was of the greatest value. A list of the names will be found on p. 30.

As a preliminary step, a circular letter, giving full particulars of the Exhibition, was sent to a large number of manufacturers and others interested, and a letter of a similar nature was also sent to each of the Chambers of Commerce of the United Kingdom requesting their assistance and co-operation; the response received in each case was most unsatisfactory, only three of the Chambers of Commerce offering their co-operation and but few private firms expressed any desire to participate in the Exhibition. The Committee, having made exhaustive inquiries, found it possible to form collective exhibits in the classes for decoration and furniture, ceramics, lace and embroidery.

At the request of the Committee the organisation of the first was undertaken by Sir C. Purdon Clarke, C.V.O., C.I.E., and Sir George Donaldson, the second by Mr. S. J. Cartlidge, and the last named by Mr. Alan S. Cole, C.B.; the entire cost in the two latter cases being defrayed by the Royal Commission. These exhibits were more comprehensive and displayed more thoroughly the particular industry than would have been the case had firms and private individuals installed their own exhibits. Special reports on these exhibits are annexed.

Endeavours were also made to secure collective exhibits in the classes for cloth, silversmiths' and goldsmiths' ware, glass, carpets, clock and watchmaking, and the manufactures carried on in the town of Redditch and neighbourhood; it was, how-

ever, found that there was so much apathy and in many cases repugnance to the Exhibition, chiefly on account of the prohibitive duties imposed by the United States, that, after mature consideration, the Committee determined that it was inadvisable to press the matter.

One of the most important exhibits in the section was made by Messrs. Platt Brothers & Co., Ltd., of Oldham, who showed a very extensive cotton-spinning plant in operation. On the urgent representation of the Royal Commission the Administration of the Exhibition agreed to forego the regulation charge for the motive-power for driving this machinery. It may be mentioned that this exhibit was the only one dealing with the process of the manufacture of cotton-yarns in the whole of the Exhibition, and was therefore of very great interest to visitors in general as well as to those interested in the cultivation and the manufacture of cotton.

Important exhibits of furniture and house decoration were made and carried out by Messrs. G. Trollope & Sons (whose extensive exhibit occupied the north wing of the Royal Pavilion), Messrs. Waring & Gillow, Messrs. Ch. Mellier & Co., and Messrs. William Birch, Ltd.

There was also a comprehensive display of Irish and Scotch table and household linen as well as crapes, of which there is a considerable import into the United States, and there were several exhibits made by private firms of which may be mentioned Messrs. Doulton & Co., Ltd., stoneware and faience, Messrs. Wengers, potters' colours, and the Singer Manufacturing Co., who showed sewing-machines for every description of work for which such machines are applicable.

The Committee are glad to state that the British section was much more advanced towards completion on the day of the opening of the Exhibition than any other section in the Department of Manufactures, the collective exhibits for which the Committee were directly responsible being ready in all respects for the inspection of the public.

The Administration of the Exhibition allotted an area of 58,000 superficial feet to the British section, which was found to be sufficiently large to accommodate the whole of the exhibits which the Committee, under the circumstances, considered desirable should be shown in the several classes into which the group was divided.

In the collective exhibits of ceramics and of lace and embroidery the Committee undertook the sale of the articles exhibited, and referred those inquiring for more extensive purchases, for which the exhibit served as samples, to the manufacturers. In cases where sales were effected, the Royal Commission paid the customs duties, which were added to the sale price, afterwards collecting the money from the purchaser and transmitting it to the owners without any deduction beyond the actual amount disbursed for Custom House duties, a separate account at the banks in St. Louis and London being opened for this purpose. Some little difficulty was experienced in making the customs entries and withdrawing the articles from bond, as special regulations had to be complied with to allow any particular article to be withdrawn from a consignment, of which they formed part, without paying the duties on the whole consignment, as would be the case in an ordinary commercial transaction. Upon all articles sold the condition was imposed that the purchaser should take delivery of them within one week of the close of the Exhibition, but this condition, owing to the formalities exacted by the Custom House and the delay in carrying them out, was found to be impossible, and consequently the Royal Commission were obliged at a later date to pack and forward by an express company all the articles purchased by persons living outside the city of St. Louis. The sales in the ceramic section amounted to £213 4s. 9d. and those in the lace and embroidery to £178 18s. 6d. At the close of the Exhibition all the articles which were not sold were returned to their owners free of all expense to them, and in the cases where articles were broken or damaged, their value refunded through the insurance effected by the Royal Commission. The repacking was done under difficulties owing to the intense cold, but the Committee are glad to be able to state that goods reached England without loss or any great amount of damage.

As Chairman I desire to express my most sincere thanks to the members of the Committee for their assistance, and especially to Mr. S. J. Cartlidge, Mr. Alan S. Cole, Sir C. Purdon Clarke, Sir G. Donaldson, etc., and also to Mr. E. H. Lloyd, our Secretary, for his courtesy and zeal.

CASTLETOWN OF UPPER OSSORY,
Chairman of the Committee.

REPORT ON THE COLLECTIVE EXHIBIT OF CERAMICS.

BY S. J. CARTLIDGE, ESQ.

The Manufactures Committee of the Royal Commission for the St. Louis Exhibition decided in April, 1903, to take action with the view of providing a Collective Exhibit of British ceramics and glass. After some fruitless preliminary steps in this direction had been taken, the Committee, in June, 1903, requested one of its members to undertake the provision and organization of such an exhibit, and they secured, as the result of his labours, an attractive and representative collection of pottery, potters' appliances, and tiles. It was found impossible to arrange for any specimens of glass to be sent for exhibition.

The collection thus obtained comprised ceramics of great diversity in character and material, from the coarse-bodied but quaintly shaped and decorated pottery of Wales to the fine porcelain or "china" manufactured in Staffordshire. The specimens of earthenware included the useful plain white "granite" as well as the finer kinds, such as the "semi-porcelain," so largely exported to the United States. The tiles ranged in class from the plain "bath" tile to the richly-decorated "cloisonné coloured glaze," the "majolica" and the "faience" varieties.

The Royal Commission having undertaken to bear the cost of transport, installation and return of all the exhibits in the collective display, the exhibitors, after arranging their specimens in show-cases similar to those provided at St. Louis in accordance with a plan devised and explained to them by the organizer of the exhibit, forwarded them to the shipping agents of the Royal Commission, who transmitted them to St. Louis direct.

On arrival at St. Louis the exhibits were arranged in conformity with drawings and photographs, sent by the exhibitors, showing the exact position of each piece, in 27 show-cases, and the tiles on wall and floor space, in a handsome court

having a floor area of 3,200 square feet, enclosed by a barrier and a special platform.

Prominent in the centre of the court were three cases of choice specimens of porcelain contributed by the historic firm of Mintons, Stoke-on-Trent. These were remarkable for perfection of manufacture and consummate artistic qualities, seen as conspicuously in the dainty teacups and saucers, and dessert plates, as in the masterly reproductions of "Henri Deux" ware and the unique and charming "Pâte sur Pâte" vases designed and decorated by M. Solon. Messrs. Doulton & Co., Ltd., of Lambeth and Burslem, showed some beautiful china vases embellished with paintings of flowers and medallions upon coloured grounds, of which one of the richest in tint was the "Bleu de Roi." The tasteful gilding of some of the pieces was striking in its delicacy and unity of effect. The exhibit included pieces of salt-glazed coloured stoneware so well known under the name of "Doulton ware"; of "Lambeth faience" decorated with underglaze paintings; and of "fine stoneware" or salt-glazed brown ware. Their exhibit as a whole well illustrated the chief among their finer productions from both Lambeth and Burslem.

An interesting show of "ironstone china" was contributed by Messrs. Geo. L. Ashworth & Brothers of Hanley, the specimens being reproductions of the "Mason ironstone china" so much in vogue in the early part of last century. Messrs. Ashworth, being the proprietors of the original designs, moulds and copper plates produced by Mason, were able to show facsimiles of the original pieces, which are characterised by bold picturesque form, and lively if somewhat bizarre decoration. Among the newer developments in British ceramics is the "Ruskin pottery," by Mr. W. Howson Taylor of Birmingham, who sent a number of vases, cups, saucers, candlesticks, etc., showing diverse and lovely effects obtained by well-designed simple shapes, broken tints of colour, and variety of surface texture. These specimens were remarkable for thinness and lightness of body and a limpid, leadless glaze of fine quality. The artistic merit of the "Ruskin ware" is mainly due to the influence of Mr. Edward R. Taylor, late Head Master of Birmingham School of Art.

Messrs. Johnson Brothers, of Hanley and Tunstall, displayed a collection of fine "semi-porcelain" earthenware in plain white with embossed decoration, and in printed and gilt patterns, the

show being marked by artistic shape, perfect finish, and good colour. Excellent specimens of "semi-porcelain," evincing much taste and effectiveness in design, were also shown by Messrs. Booths, Ltd., of Tunstall, W. Harry Grindley & Co., of Tunstall, John Maddock & Sons, Ltd., of Burslem, and Alfred Meakin, Ltd., of Tunstall.

In face of the competition now developing in consequence of progressive improvements in the *fabrique* of American pottery, some of which is now made extremely hard and durable in substance, several new "bodies" compounded with the dominant aim of durability have latterly been produced in Staffordshire. Among these are the "Royal Vitreous" and vitrified porcelain of John Maddock & Sons, of Burslem, and the "Silicon" china made by Booths of Tunstall; and some good examples of this "hard" pottery were shown by both firms, possessing much finish and distinction in manufacture and style. Among the purely decorative pieces of pottery, Devonshire productions were prominent, Mr. Wm. Leonard Baron of Barnstaple exhibiting in his "Barnstaple ware" some charming examples of *Sgraffito* decoration finished with richly-coloured glazes. Most of this pottery is made on the wheel and decorated by Mr. Baron, who is a certificated Art Master. Mr. C. H. Brannam, also of Barnstaple, contributed many examples of his "Barum ware," now becoming well known amongst the various kinds of decorative pottery. Mr. E. H. Bulley of Torquay exhibited a selection of his "Slip" decorated pottery, all of which is entirely made and decorated by hand. Fifty-seven pieces of beautiful pottery, designed by and executed under the direction of W. Moorcroft, were exhibited by Messrs. James Macintyre & Co., Ltd., of Burslem. Some of these interesting pieces were decorated by outlining the design with clay, the space between the outlines being filled in with metallic oxides under the glaze. Others were decorated entirely in coloured clays, and all were distinguished by refinement in design and colour. Some tasteful decorative pottery, well designed and varied in contour, form, and pattern, was shown by Messrs. Wardle & Co., Ltd., of Hanley; and the quaint shapes, decorations and animals embodied in the pottery exhibited by the Welsh Industries' Association were effective and well chosen. The Crown Staffordshire Porcelain Co., Ltd., of Fenton, sent a display of delicate and dainty porcelain comprising a great variety of pieces in white china and

in china richly decorated. The handsomely modelled cupid jugs, and the wicker baskets were striking features of this show.

The display of tiles was centred by the exhibit of Messrs. Minton, Hollins & Co., Stoke-on-Trent, consisting of a handsome faience drinking fountain with glazed mosaic basin ; a large tile panel decorated with a subject illustration of St. Louis in cloisonné coloured glazes ; floor sections in vitreous ceramic mosaic and original Minton encaustic tiles ; also wall tiles in majolica, all being distinguished by tasteful rich colour and effective balance of form and treatment. Messrs. G. Woolliscroft & Co., of Hanley, contributed decorated wall tiles, tile hearths and fenders, and faience gas-stoves, all virile in design and colour. Messrs. Sherwin & Cotton, of Hanley, showed some glazed tiles for interior decoration which were well designed and manufactured. Embossed, enamelled and plain white tiles in good taste and well finished were shown by Alfred Meakin, Ltd., of Tunstall, and Johnson Brothers of Hanley.

Sales to the amount of £213 4s. 9d. were effected by the officers of the Royal Commission without expense to the exhibitors. These sales were naturally few in view of the heavy duty charged by the United States Authorities, but they will doubtless have their effect in introducing British ceramic productions to new localities.

Some of the exhibits arrived at St. Louis in a damaged condition and a few breakages occurred on the return journey. These were scarcely avoidable, and it is gratifying to know that the Secretary of the Royal Commission has received letters of appreciation from most of the exhibitors expressing satisfaction with the facilities and assistance given.

S. J. CARTLIDGE.

REPORT OF THE SUB-COMMITTEE FOR THE COLLECTIVE EXHIBIT OF LACE AND EMBROIDERY.

BY ALAN S. COLE, ESQ., C.B.

Early in July, 1903, the Royal Commission for the St. Louis Exhibition considered it desirable that a scheme should be framed for making a collective display of British Laces and Embroideries, to which were added subsequently Decorative Textiles; and a Committee was formed to undertake the necessary arrangements for forming such an exhibit. The central idea was to illustrate, as far as practicable, by means of costumes, hangings, furniture, and small objects of use, the employment for definite purposes of these various textile fabrics, rather than to display merely lengths and samples of them.

The Court in which the collection was arranged was erected, from the design of Mr. F. Stuart Murray, by Messrs. Warings, Limited, of London. In plan it consisted of a double court, having a main southern entrance on the line of its central axis, with four side entrances—two on each side, east and west. Each court was rectangular, and the cases which contained the exhibits formed a glazed continuous portico surrounding a central open space. The exterior was designed with a first regard to the suitable display of a series of panel paintings, illustrating laces and embroideries in costumes from the sixteenth to the nineteenth centuries, and was an architectural composition of pilasters of the Tuscan order with panels or bays between the pilasters. The style may be considered to be English based upon architecture of Sir Christopher Wren's period. The entrances were surmounted by bold curved pediments carrying the achievement of the Royal Arms of Great Britain and Ireland, and were hung with curtains. Three pairs of these were of embroidery from (1) the Royal School of Art Needlework, South Kensington, London (main south entrance); (2) the Macclesfield School of Embroidery (south-west entrance); and (3) the embroidery works of Mr. Arthur H. Lee, of Warrington, and also of 31, Union Square, New York (south-east

entrance). Of the remaining two pairs, one was of printed velvet by Messrs. Turnbull & Stockdale, of Manchester and London (at the north-east entrance), and one of woven tapestry by Mr. Arthur H. Lee, of Warrington, and also of 31, Union Square, New York (at the north-west entrance). The interior treatment of the Court was of a simple classic type. Narrow pilasters divided the space into bays, above which was a light entablature. The pilasters sprang from a low base about two feet high, which gave the floor-line for the glass cases containing the various objects exhibited.

The twelve paintings on the exterior were adaptations by students at various Schools of Art in England and Scotland of portraits by old masters as follows:—On the western façade, (*a*) Gaston de France, Duc d'Orleans, by Sir Anthony Van Dyck, in the Museum, Chantilly, France, adapted by Joanna Herbert, School of Art, Glasgow, and illustrative of early seventeenth century pillow-made flat lace; (*b*) the Wife of Nicholas van Berensteyn, by Franz Hals, in the Louvre Museum, Paris, adapted by Charles Dowell, School of Art, Glasgow, and illustrative of early seventeenth century gold-thread embroidery and Reticella lace; (*c*) William van Huythuysen, by Franz Hals, in the gallery of His Highness the Prince Liechtenstein, Vienna, adapted by Isabel Hotchkiss, School of Art, Glasgow, and illustrative of early seventeenth century Reticella lace. On the main southern façade, (*d*) Queen Elizabeth, by F. Zuccherro, in the collection at Chatsworth House, Derbyshire, belonging to his Grace the Duke of Devonshire, K.G., adapted by Winifred L. Stamp, School of Art, Regent Street Polytechnic, London, and illustrative of sixteenth century lace and coloured embroidery; (*e*) King Charles IX., by François Clouet, in the Imperial Gallery, Vienna, adapted by W. A. Chase, School of Art, Regent Street Polytechnic, London, and illustrative of gold thread embroidery; (*f*) Countess of Derby, by Cornelius Janssens, in the Victoria and Albert Museum, South Kensington, London, adapted by W. A. Chase, School of Art, Regent Street Polytechnic, London, and illustrative of seventeenth century flat pillow lace; (*g*) Jacques Bénigne Bossuet, Bishop of Meaux, by Hyacinthe Rigaud y Ros, in the Louvre Museum, Paris, adapted by Charles W. Sharpe, School of Art, Liverpool, and illustrative of pillow-made lace of the late seventeenth century; (*h*) A Prin-

cess of France, by Pierre Mignard, in the Museum, Niort, France, adapted by Albert W. Dodd, School of Art, Liverpool, and illustrative of rosepoint Venetian needlepoint lace of the middle of the seventeenth century ; (*i*) Marie Leczinska, Queen of France, by Carle van Loo, in the Louvre Museum, Paris, adapted by Gilbert Rogers, School of Art, Liverpool, and illustrative of eighteenth century Alençon needle-made lace and gold and silver gimp work. On the eastern façade, (*k*) King George III., by A. Ramsay, from an engraving by W. W. Ryland in the National Art Library, Victoria and Albert Museum, South Kensington, London, adapted by Allen R. Gladwell, School of Art, West Bromwich, and illustrative of eighteenth century gold embroidery ; (*l*) Princess Charlotte, by G. Dawe, R.A., in the National Portrait Gallery, London, adapted by M. Thekla Pierce, School of Art, West Bromwich, and illustrative of nineteenth century pillow-made lace ; (*m*) Queen Adelaide, by Sir W. Beechey, R.A., from an engraving by S. W. Reynolds in the National Art Library, Victoria and Albert Museum, South Kensington, London, adapted by Clara E. Sandiland, School of Art, West Bromwich, and illustrative of nineteenth century *appliqué* lace on net.

The laces exhibited in the Court represented all the principal categories for which England with her Devonshire and Buckingham cottage industries, the city of Nottingham with her vast lace manufactories, and Ireland with her Limerick, Carrickmacross, needlepoint and crochet laces, are noted. Of the embroideries a few were for ecclesiastical purposes : others were for domestic purposes—furniture, hangings, cushions, book covers, fans, and so forth, from the Royal Schools of Art Needlework in London and Dublin, the School of Embroidery, Macclesfield, and Schools at Battersea, Birmingham, Manchester and Plymouth, as well as from Miss Una Taylor, Mr. Lewis F. Day, and others. Different dresses were specially designed and made under the direction of Mrs. Vere O'Brien, Miss Audrey Trevelyan, the Countess of Mayo (President of the School of Art Needlework in Dublin), Messrs. Switzer of Dublin, M. Viola and Messrs. Debenham & Freebody of London, with the particular intention of showing off various English and Irish laces and embroideries ; the dresses were arranged upon suitable life-like figures. The jewellery on them was kindly lent by the Gophir Diamond Company, of Regent Street, London. Amongst

the decorative weavings contributed by J. O. Nicholson of Macclesfield, Messrs. Grout & Company of London, Liberty of London, Lee of Warrington and New York, and Messrs. Turnbull & Stockdale of Manchester and London, were specimens of delicate silks, gauzes and crêpes, heavy brocades and damask satins, printed linens and velvets. There were other interesting examples of novel work from hand looms recently established by Miss Garnett at Windermere, Miss Phillpotts at Canterbury, and Mr. Hunter at Haslemere.

Descriptive labels were affixed to the articles and specimens exhibited. The Royal Commission were indebted to the exhibitors for their generous and ready co-operation in giving effect to the scheme. The arrangement of the collection at St. Louis was entrusted to Mr. Ernest Biddle.

The packing and return of the exhibits were undertaken by the Royal Commission, and it is gratifying to note that exhibitors have expressed their satisfaction in letters to the Secretary, on the return of the various articles composing the collection, notwithstanding the fact that, owing to the heavy duty imposed by the United States Authorities, few sales were effected.

ALAN S. COLE,
Chairman of the sub-Committee.

REPORT OF THE MACHINERY AND ELECTRICITY COMMITTEE.

BY COLONEL SIR HERBERT JEKYLL, R.E., K.C.M.G.

The Committee appointed by the Royal Commission to organise the Departments of Machinery and Electricity held their first meeting on the 27th March, 1903, and at once took steps to ascertain the extent to which the co-operation of mechanical engineering firms might be expected, enquiries being made throughout the country both by personal interviews and by letters addressed to engineering societies and engineering firms. The replies showed that no engineering firms were prepared to take part in the Exhibition, even to the extent of furnishing engines or dynamos for the motive power plant, for which the Administration of the Exhibition were willing to pay all expenses. The Committee thereupon requested the Secretary of the Royal Commission to express to the American Authorities their regret that Great Britain would not be represented officially in the Machinery Section.

The electrical engineering firms having also declined to take part in the Exhibition, the Committee appealed to the Institution of Electrical Engineers with a view to form such a collection of electrical machinery and apparatus as would, in their opinion, represent the industry of this country. The Council of the Institution, after considering the matter in its various aspects, came to the conclusion that an adequate representation of the electrical industry of Great Britain would entail the expenditure of a very considerable sum of money, without which they regretted that they would be unable as an Institution to carry out the Committee's project. They were, however, willing to afford assistance to the Committee by giving advice should it be desired. In these circumstances the Committee decided to form a collective exhibit of instruments used in determining the value and measurement of electrical currents, and other apparatus in connection with telegraphic, telephonic, and the medical branches of the science, bearing the whole cost of

exhibiting them, including the provision of suitable show-cases, fittings, and other incidental expenses. The Committee then approached the proprietors or manufacturers of instruments with this proposal, and offered to appoint a technical assistant who would explain the construction and working of the instruments, and, if possible, promote their sale.

Under these conditions sixteen firms willingly contributed selections of their finest instruments. The Director of the National Physical Laboratory having acceded to the request of the Committee to facilitate the testing of the instruments lent for exhibition, a number were sent for verification and standardising, and received certificates. Many of the instruments were original in design, and, as neither the United States nor any of the other foreign countries exhibited the same description of instruments, the British Section was a source of interest to technical and scientific visitors to the Exhibition, and was greatly appreciated.

The General Post Office, at the request of the Committee, lent an historical set of transmitting and receiving instruments, illustrating the progress of telegraphy from the acquisition of the telegraphs of the country by the State in 1870 until the present time, the modern instruments being shown in operation and explained to visitors.

Mr. F. B. Behr approached the Committee with a view to exhibit a model of his system of Mono-rail high speed railways, and as it was considered that this would afford an illustration of a system of electrical traction which had been much discussed, the Committee recommended that financial assistance should be given towards the cost of constructing the model, defraying the cost of freight and insurance and showing it in operation. This exhibit excited great interest among those interested in the railway work of the United States, and the public, who attended in considerable numbers at the hours fixed for the model to be shown at work.

Demonstrations were also given from time to time of other instruments, such as Duddell's Oscillograph, Röntgen Ray and High Frequency Apparatus.

Owing to the high Customs tariff of the United States (from 60 to 70 per cent. ad valorem) very few instruments were sold to the public, but many were disposed of to the Universities and Colleges in the United States, who were able to claim

exemption from duty on the ground that the apparatus was required for Educational purposes.

In the Electricity Palace, the Administration had proposed to allot 9,833 square feet of floor area, but as it was found that so large a space would not be required for the display of the collection of instruments, they were informed that a section measuring 5,960 square feet would be sufficient for the British installations.

At the close of the Exhibition the show cases were sold to the University of Kansas, who had also purchased several of the instruments exhibited.

The Committee had the advantage of the assistance of Mr. J. H. Cundall, who acted as their secretary and superintended the arrangement of the section. Mr. Cundall's long experience and technical knowledge of the subject were of the greatest value to the Committee, and contributed materially to the success of the installation.

HERBERT JEKYLL,
Chairman of the Committee.

REPORT OF THE COMMITTEE FOR LAND TRANSPORTATION EXHIBITS.

BY THE HON. C. N. LAWRENCE.

The Committee for Land Transportation Exhibits held their first meeting on 24th March, 1903, and at once took steps to ascertain the extent to which it was probable that those interested in objects set forth in the classification would be willing to participate in the Exhibition; but notwithstanding the efforts made to reach all branches of the manufacturers whose products would be shown in the Department, the response received was in almost every case to decline to take part in the Exhibition.

Two of the leading railway companies, the London and North Western and the East Coast Joint Railways, made an important display, and mention may be made particularly of the exhibit by the former company, which included a complete length of the permanent way in use on their system, and this, being entirely different to anything in use on the American railways, created considerable attention. In addition, the same company exhibited the saloon carriage in use by Queen Adelaide in 1842, as well as models of the King's saloon, and, in conjunction with the Caledonian Company, the sleeping saloon in use on the West Coast Joint Railways, together with other models and photographs of great interest.

The American Administration having assigned a larger area than was required for the exhibits of the Transportation Section, a part of the space was occupied by exhibits belonging to the Civil Engineering Section, which should have been shown in the Liberal Arts Building, but where the space was insufficient to accommodate all that was included in the classification for that Department, and as these exhibits were mostly allied to railway work, they formed an appropriate adjunct and tended to the general interest of the section, particularly the drawings, maps and photographs contributed by the Public Works Department of India.

The Committee were authorised by the Executive Committee to incur certain expenditure in forming a collective

exhibit, or in contributing to the expense of any important exhibit, should it be considered advisable to do so, but as nothing of a sufficiently interesting nature was offered to the Committee, no financial assistance was required for the section.

The Committee would wish to express their entire appreciation for the very able assistance which they derived from their Secretary, Mr. J. H. Cundall, and for the manner in which he arranged for the transportation and installation of the exhibits.

C. N. LAWRENCE,
Chairman of the Committee.

REPORT OF THE COMMITTEE FOR SEA TRANSPORTATION EXHIBITS.

BY THE RIGHT HON. LORD INVERCLYDE.

The Royal Commission entrusted to the Committee for Sea Transportation Exhibits the formation of the section set apart for the display of objects relating to the Naval Service and the Mercantile Marine, and for this purpose the large ship-building and ship-owning companies, together with manufacturers of accessories used in connection with shipping, were communicated with, in many instances by personal interviews by members of the Committee, but, notwithstanding the efforts which were made, it was found that there was a general disinclination to take part in the Exhibition.

His Royal Highness the Prince of Wales was graciously pleased to lend two beautiful models, H.M.S. "Albion" and the R.M.S.S. "Ophir," which were placed at the entrance to the section and were of great interest to visitors. The Cunard Company contributed a large and most important collection of models of vessels of their fleet from its formation, up to and including the ships now being constructed for the Company, illustrating the development of ocean passenger travel, the exhibit being the largest and most complete of any display in the Marine Department of the Exhibition. Other steamship companies made less important exhibits, and one of the large ship-building firms sent an interesting collection of models of ships and a floating dock, for which the Royal Commission defrayed the expenses.

A number of models and drawings of harbour and marine engineering work that were classified under the Civil Engineering Section were also exhibited in the Department owing to the space in the Liberal Arts Building, where they should have been shown, being overcrowded, and these exhibits, together with those mentioned, made the British Section of the Department a most comprehensive display.

It may be mentioned that the International Mercantile

Marine Company, which is an association of British and American shipping companies, had, in the American Section, an exhibit composed almost entirely of models of ships built in the United Kingdom, and as this exhibit was placed next to the British Section it added to the display of British built ships.

INVERCLYDE,

Chairman of the Committee.

REPORT OF THE AGRICULTURE, HORTICULTURE,
FORESTRY, FISH AND GAME COMMITTEE.

BY THE RIGHT HON. LORD ALVERSTONE, G.C.M.G.

The Committee appointed to organize the Departments of Agriculture, Horticulture, Forestry, Fish and Game held their first meeting on the 26th March, 1903, and subsequent meetings were held at intervals until the end of that year. Invitations to exhibit were issued by the Committee to Societies, Associations and Manufacturing firms who were interested in the production of, or researches in, the objects enumerated in the classification of the several Departments, and enquiries were also made with the same object by individual members of the Committee in branches of the classification in which they were personally interested. It was found that from various causes, chiefly owing to the high customs duties in force in the United States, there was on almost all sides great reluctance to taking any part in the Exhibition, unless the entire cost of an exhibit was borne by the Royal Commission.

As the Committee were aware that the cost of making a representative exhibit of the manufacturers included in the classification would amount to a very considerable sum, they were unable to recommend that the Royal Commission should incur such a heavy liability. It was therefore determined that, with the exception of defraying the cost of the exhibit which the Lawes Agricultural Trust were, at the request of the Committee, willing to prepare for the Agricultural Section; a collection which the Marine Biological Association at Plymouth undertook to form, a selection of specimens of heads of African Game lent by Major Gibbons, and a Collective Exhibit of sporting guns and rifles for the Fish and Game Section, it was not advisable that further pecuniary aid should be afforded.

The Administration of the Exhibition offered to allot an area of 28,500 square feet in the Agricultural Building for the purpose of the British Exhibit; but as it was found that the whole of this space would not be required, a portion of this was

abandoned, leaving 20,900 square feet of exhibiting space which was largely taken up by a working exhibit of confectionery and bakers' machinery by Messrs. Joseph Baker & Sons.

Shortly before the opening of the Exhibition, the Royal Commission were requested by the Colonial Office to take charge of and arrange a collection of products of the Gold Coast Colony, which had been prepared by the Botanical Department and sent to St. Louis. Five consignments of Indian pickles and condiments were delivered at the Exhibition from manufacturers in various parts of India, and as no provision had been made for exhibiting them, the Chief of the Agricultural Department of the Exhibition requested the Royal Commission to assume the charge and make arrangements for so doing. Show-cases were accordingly provided and the exhibits suitably arranged, the owners being subsequently asked to bear a proportion of the expense incurred. A considerable collection of photographs of growing crops of the produce of Jamaica and of the scenery of the Island, together with samples of coffee, were received by the Exhibition Authorities, and these also the Royal Commission were requested to exhibit in the Agricultural Section. These photographs were, with the consent of their owners, presented at the close of the Exhibition to the Smithsonian Institute at Washington.

The foregoing exhibits, together with that contributed by the Lawes Agricultural Trust, for which the Royal Commission undertook to defray all expenses, and which consisted of photographs showing typical wheat plants from seven of the plots in the Broadbalk Field, taken in the thirty-fifth and fifty-sixth year of the experiments; photographs of twelve typical turves taken in 1903 from the grass plots in the Park, Rothamsted, showing the effect of forty-eight years' continued treatment with the same manures; diagrams showing some of the results obtained during the forty-eight years' period on the grass plots in the Park, both as regards weight of crop and its botanical composition; specimens of the chief grasses, clovers and weeds occurring on the grass plots in the Park, with a diagrammatic representation of the proportion of each in the hay crop of 1903 on certain of the plots; the Royal Agricultural Society of England, who presented Reports and Publications, Coloured Diagrams relating to the Life History of the Wheat Plant, Insects injurious to Farm Crops, and the Potato

Disease ; in addition the British South Africa Company, and three Whisky Distilleries, two Manufacturers of Condiments, and other less important exhibits, constituted the whole of the display in this Department.

In the Forestry, Fish and Game Section 5,000 square feet of floor area were offered to the Royal Commission ; but as the invitation of the Committee to manufacturers had practically no response, it was considered 3,900 square feet would be sufficient to accommodate the Collective Exhibit of Sporting Firearms which it was determined to form as well as the collection organised by the Marine Biological Association, the contribution of the Forest Department of India, and other exhibits which the Committee had been able to secure, and for which it was necessary that the whole cost should be borne by the Royal Commission.

The chief firms of gunmakers were invited to send a selection of their weapons for exhibition, the Committee offering to pay the freight charges, to place a specially designed show-case at the disposal of each firm, and to appoint a practical man to take charge of the exhibits and, if possible, sell them during the Exhibition, or return them to their owners at its close free of charge. In all nine firms accepted the invitation, and two firms determined to exhibit independently of the Committee. There were thus eleven cases of sporting guns, which created a considerable amount of interest ; but, owing chiefly to their high price, it is to be regretted that, with two exceptions, it was not possible to effect any sales. It is believed, however, that the firms who contributed to the Collective Exhibit are in most cases satisfied with the result of the Exhibition, as additional inquiries have been received in consequence.

The Marine Biological Association, at the request of the Committee, formed a collection to illustrate the growth of the principal fishes which serve as human food in the British Isles, the Committee undertaking to contribute to the cost of the formation of the collection to the extent of £200, to bear the cost of transport and to defray the salary and travelling expenses of a technical assistant to instal the collection in the Exhibition. At the close of the Exhibition the collection was purchased by Messrs. Horlick's Malted Milk Company and presented to the Fish Department of the National Museum at Washington.

The Horticultural Section, the Committee considered, could best be organised by the formation of an old English garden to harmonise with the Royal Pavilion, and Mr. W. Goldring, or Kew, was requested to prepare a design in conjunction with the architects of the Pavilion. The design of the garden having been approved, a practical gardener from the Royal Botanic Gardens, Kew, was engaged to carry out the work, and was instructed to proceed to St. Louis in July, 1903. As the site assigned to the Royal Pavilion had a considerable slope, and the design which had been prepared necessitated practically a level plateau, some time was required in adapting the ground to the purpose. The florists and seedsmen of the United Kingdom were communicated with to ascertain how far they would co-operate by exhibiting flowering plants or providing seeds to be raised in St. Louis, and a liberal response was received; the following firms contributing selections of plants and seeds in accordance with suggestions which were made to them as to the description of flowers required:—

Messrs. Cannell & Sons, Carter & Co., J. Cheal & Sons, W. Cutbush & Son, Hobbies Ltd., Kelway & Son, Sutton & Sons, Sander & Sons, Mr. John Forbes and Mr. Amos Perry.

The plants and seeds were forwarded to St. Louis during the autumn of 1903, where arrangements were made for their propagation and display at their proper season. The trees required for forming the "Pleached Alley" and the outer boundary of the garden, as well as a large number of shrubs, flowering and otherwise, were purchased in the United States, the transportation from England of so large a quantity of growing trees being impracticable in the time. The garden, with its large variety of flowers thus exhibited, throughout the period of the Exhibition was greatly admired, and was a source of considerable attraction to visitors as an example of the methods of treating a garden in accordance with the architecture of the building it surrounded. Sixty large clipped yew and box trees (topiary work), which were lent by Messrs. Cutbush and Sons to be placed on the terrace of the Pavilion and in other appropriate positions in the garden, were of great interest, this branch of horticulture being almost unknown in the United States. These trees were sent out under special arrangement with the Steamship Company to St. Louis at the latest possible date to arrive in time for the opening of the Exhibition, as it was feared they would be damaged by the

severe frost prevailing in the early spring, and those which remained unsold were, for the same reason, dispatched immediately the Exhibition closed.

At the close of the Exhibition, the garden, with the trees, shrubs, grass lawns, fountains, vases and seats, was handed over to the Washington University of St. Louis, which owns the land, and will be maintained by that body until the ground is required for other purposes.

In the Horticultural Building a series of photographs and a plan of the Royal Botanic Gardens, Kew, were exhibited by the Board of Agriculture and Fisheries, these being afterwards presented to the Missouri Botanical Garden, St. Louis.

The Members of the Committee desire to place on record their appreciation of the services of Mr. J. H. Cundall in connection with the work of this Committee.

ALVERSTONE,
Chairman of the Committee.

REPORT OF THE COMMITTEE FOR MINES AND METALLURGY.

BY H. H. S. CUNYNGHAME, ESQ., C.B.

The first meeting of the Committee for Mines and Metallurgy was held at the Offices of the Royal Commission on March 27th, 1903, when it was decided that it would be preferable for the members of the Committee to use their personal influence to induce firms and others to exhibit at St. Louis, rather than to circularise them. The Committee accordingly approached the whole of the large Mining Institutions, Journals, and the various Schools of Mines, in an attempt to interest them in the work of the Royal Commission. The response was small and this was only to be expected, seeing that exportation of mining products from the United Kingdom to America was out of the question. It was therefore decided that the Committee should suggest to the Royal Commission the advisability of their defraying the cost of carriage, etc., in order that a representative collective display might be made.

In accordance with this decision and the Executive Committee's concurrence, Professor Sir Clement Le Neve Foster, Dr. J. J. H. Teall, Professor Gowland and the Chairman undertook the work, after obtaining a grant from the Executive Committee to meet the expense of preparation, show-cases and installation of exhibits, with the result shown in the Mining Section of the British Catalogue.

The Royal Commission undertook, upon the suggestion of the Committee, to prepare models of the Assynt and Purbeck, and these proved of great interest to visitors to the Mining department.

The entire Mining and Metallurgical exhibit occupied a floor-space of 11,700 square feet.

Amongst the most important exhibits may be mentioned the collection of Mining photographs brought together by the late Sir Clement Le Neve Foster, the comprehensive collection of minerals arranged by Mr. West Ware, of the Home Office, and the models exhibited by the Board of Education, in which

Mining experts expressed great interest, as well as in the collection of mineral specimens sent by the Department of Agriculture and Technical Instruction for Ireland, whose exhibit was much admired.

After the opening of the Exhibition the Chairman conferred with other members of the Royal Commission and decided that it would be preferable to return the whole of the exhibits to this country and present them to various Institutions. They were consequently distributed to the Home Office, the Imperial Institute and the Royal School of Mines, the Royal Commission being of opinion that exhibits of so great an educational value would benefit our National Institutions by their acquisition.

The Committee desire to express their regret at the untimely decease of Sir Clement Le Neve Foster, who so materially assisted in the formation of the successful display made by Great Britain; to thank Professor Gowland for his earnest efforts to obtain a complete exhibition of Metallurgical specimens, and Mr. West Ware for the manner in which he collated the collection of British minerals in the Home Office exhibit.

The Committee also desire to thank the various other gentlemen for the time and services they gave at the different deliberations which were necessary to obtain the display.

The thanks of the Committee are also due to the British Commissioner-General and to Mr. E. H. Lloyd for the assistance they gave the Committee at St. Louis.

HENRY CUNYNGHAME,

Chairman of the Committee.

REPORT ON INSTALLATION, TRANSPORTATION, ETC.

BY COLONEL SIR C. M. WATSON, R.E., K.C.M.G., C.B.,
Secretary of the Royal Commission.

INSTALLATION.

The Royal Commission, at the meeting of the 28th April, 1903, nominated nine Committees to take charge of the Groups into which the Classification of the Exhibits was divided, and power was given to each Committee to form sub-Committees to deal with special subjects, and to seek the assistance of gentlemen who had a knowledge of these subjects, and to add their names to the sub-Committees.

As a preliminary step, a printed copy of the address of His Royal Highness the Prince of Wales to the Royal Commission at their first meeting, the Classification and Regulations of the Exhibition and Forms of Application for space were sent to a large number of firms who had exhibited at previous exhibitions, and others whom it was considered might be desirous of exhibiting. The response received was of so limited a nature, that it was evident that, in order to ensure a suitable representation of British Arts and Manufactures, financial assistance would have to be given from the funds at the disposal of the Royal Commission. The Executive Committee therefore empowered the Departmental Committees to form Collective Exhibits in certain groups, the objects being loaned by the owners of the manufactures, while the cost of transportation, installation, and other expenses was to be borne by the Royal Commission. The result proved that the decision was a wise one, as much of the success of the British Sections at the St. Louis Exhibition was due to the adoption of the principle of Collective Exhibits. All manufacturers who preferred to exhibit independently were granted space free, but the cost of installation and transportation was defrayed by themselves, and not by the Royal Commission. A copy of the Regulations governing independent exhibits is annexed, see page 179.

The promises of the loan of the selected Exhibits having

been secured, it became necessary that persons should be appointed, who should have immediate charge under the direction of, and be responsible to, the Secretary of each of the Committees, for the arrangement and care of the Exhibits in the several Departments. A staff of workmen was also provided, whose duty it was to keep the Section clean and act as Guardians during the hours the Exhibition was open to the public.

The exhibiting spaces in the various Buildings were roughly floored by the Exhibition Administration, the main or compulsory passages alone being finished with smooth floors laid above the rough floor; it was therefore necessary that a finished floor should be provided at the cost of the Royal Commission or the Exhibitor to whom the allotments belonged.

In order to mark definitely the space allotted to Great Britain and Ireland in each Exhibition Palace, it was decided to enclose it with an ornamental façade, within which was placed all the British Exhibits in the Department. Alternative designs were prepared for the approval of the Executive Committee, and that submitted by Messrs. George Trollope & Sons, Ltd., was selected. This firm was requested to submit an estimate for its complete erection, and also for laying the finished floors in those parts of the various allotments which were to be used for the Collective Exhibits formed by the Royal Commission, as well as the screening required for the display of drawings and photographs.

Their tender was as follows :—

	£	s.	d.
The Façade, per lineal foot	2	17	0
For each Archway, forming the entrance.	250	0	0
For the Screening, exclusive of the burlap covering, one shilling per square foot, and for the flooring, £1 5s. 0d. per one hundred superficial feet.			

Messrs. Trollope & Sons' account for the whole of this work amounted to £9,479 9s. 2d.

In comparing the cost of this work with English prices, it must be remembered that the cost of the labour in St. Louis at the time was considerably higher than the usual American rates, which are at all times in excess of English rates.

Messrs. Trollope & Sons' contract was executed in a very satisfactory manner, and the work was completed before the opening of the Exhibition.

Show-cases of various descriptions being required, prices were obtained from British show-case makers, as well as from firms in St. Louis and other cities and towns in the United States. Upon comparison it was found that, although the prices of the English firms were somewhat lower, the difference was so small that when the cost of transport was added, they would be very considerably in excess of the American prices. It was therefore determined to accept the tender of the Beattie Manufacturing Company of St. Louis, and a first order for show-cases was placed with them in October, 1903; subsequent orders being sent as the requirements of the Committees forming the Collective Exhibits were ascertained. In all 223 show-cases of various descriptions were purchased for the exhibition of objects contributed to the Collective Exhibits, costing a total of £5,716.

For covering the bottoms and fittings of the cases, a deep red cloth was purchased in England, and sent out to St. Louis, this being fixed in the cases by upholsterers employed by the Royal Commission after the cases were delivered in the Exhibition; in the same way canvas or burlap was obtained in England for covering the screens and partitions, and was handed to the contractors to attach. A staff of carpenters was employed, constructing fittings for the show-cases, hanging plans, and generally arranging the Exhibits.

LABELS.

The Administration issued direction labels to be attached to all packing cases; these labels were of different colours to indicate the Department to which the package belonged. They were addressed to the President of the Louisiana Purchase Exposition Company, and also had upon them the name of the country from which the package was sent, and the name and address of the exhibitor. These labels were recognised by the Customs officials at the port of arrival as a sufficient guarantee that the goods were for the Exhibition, and were to be transported to St. Louis in bond without the case being opened. In addition to the labels issued by the American Authorities, the Royal Commission prepared more substantial labels with a representation of the Union Flag in the centre, and these were attached to all cases sent from this country, enabling the cases to be identified at a glance.

SALES.

In some instances the Exhibits lent to the Royal Commission were for sale at the close of the Exhibition, and tickets were attached showing their value. The Assistant Superintendents in the different sections were instructed to effect the sale of any article under their charge when opportunity offered, taking a deposit of 50 per cent. of the sale price and giving a receipt on a form which had been prepared, and on which it was stated that the article was sold upon the understanding that the purchasers would pay all expenses of packing and delivery at the close of the Exhibition, presenting the receipt as a voucher and paying the balance of the purchase money. As, however, it was found that difficulties would be created and unnecessary additional expense incurred if the Customs Duties were paid separately upon each article as it was sold, it was determined to postpone the payment of the duties until after the close of the Exhibition, when the whole of the articles disposed of out of one consignment were paid for in a lump sum upon one entry. This action caused considerable and unforeseen delay, owing to the length of time occupied by the Customs officials in freeing the articles from bond, and consequently it was impossible to deliver the articles to the purchasers immediately at the close of the Exhibition. It was therefore necessary at a later date to pack each article and forward it by an express company to the purchasers upon the receipt of the balance of the purchase money, the money received being afterwards remitted to the firms owning the goods after deducting the amount of Customs Duty.

TRANSPORTATION OF EXHIBITS.

The means of conveyance to St. Louis of the numerous Exhibits, for which the Royal Commission were responsible, was taken into consideration in the autumn of 1903, and as a preliminary step, several firms of Shipping Agents who had representatives in the United States were asked to submit quotations for the transport of the various classes of merchandise which composed the Exhibits. Upon comparison the terms offered by Messrs. Henry Johnson & Sons, whose representatives in the United States are the Export Shipping Co., of New York, were found to be the most favourable, and it was therefore deter-

mined to place the whole of the consignments in their hands to forward to St. Louis by the Steamship Companies offering the greatest facilities.

The English Railway Companies were approached to ascertain whether they would be willing to make a reduction in the freight charges on goods consigned to the Exhibition in the same way as had been done in the cases of previous Foreign International Exhibitions. The question was referred by the Companies to the Railway Clearing House, and a letter was received through the London & North Western Railway Co., intimating that the Railway Companies had agreed that a reduction of half the standard rate, to and from the port of embarkation, should be made upon all consignments, if accompanied by certificates, signed by the Secretary of the Royal Commission, stating that the goods were for exhibition at St. Louis or had been exhibited there.

The Steamship Companies trading to ports in the United States were similarly approached as to reductions in their rates, both for freight and for passenger accommodation for Exhibitors and their Agents, and they agreed, through their Association, to make a reduction of ten per cent. on all classes of rates with the exception of those for particularly valuable consignments such as pictures and statuary.

As it was anticipated that there would be considerable delay on American railways, the first consignments were dispatched early in January, and subsequent consignments were sent off as soon afterwards as they could be completed, the whole, with a small exception, being handed to the Shipping Agents by the first week in February.

The United States Customs required two copies of the invoice for each consignment, one copy to be deposited in the Customs House at New York or other port of first arrival, and the second to be sent to the Customs House at St. Louis; but notwithstanding that these instructions were strictly complied with, in most cases no invoices could be produced by the Customs Officer when the cases were delivered at the Exhibition, and, as every case had to be opened in the presence of an Inspector of Customs, and the contents checked with an invoice, it was frequently necessary to compile an invoice from the contents of the cases as they were unpacked, to be used until the original invoices could be found by the Customs Officials, a process

occupying considerable time and delaying the installation of the Exhibits. Every article upon being unpacked had a small adhesive label with a number upon it, corresponding with the number of the entry in the Customs House books, attached to it by the Customs Officer.

The first consignment was delivered in the Exhibition in the second week of February, about six weeks after its dispatch from England, but as the date of the opening of the Exhibition drew nearer, and consequently the traffic became heavier and more congested, the difficulty in obtaining delivery considerably increased, so that two months was found to be approximately the time required for a consignment to reach St. Louis from England. A large part of this delay was caused by the inadequate railway arrangements for transferring the railway cars across the Mississippi River, and again from the terminal lines in St. Louis to the terminal railway in the Exhibition grounds, and the difficulty in placing the cars, owing to the accumulation, in convenient positions approximate to the building for which the contents were intended. Cars containing mixed consignments, *i.e.*, exhibits belonging to different buildings, often required several days for unloading owing to the length of time occupied in shunting them to the various buildings.

The work of unloading the cars and the delivery of the contents on to the allotted exhibiting spaces had been given by the Administration of the Exhibition to a Company formed for the purpose, known as the General Service Company, and no persons other than this Company's employees were permitted to in any way touch the consignments. As the staff employed by the Company was not sufficiently numerous to cope with the work at the time of the greatest pressure, cars often remained in the Exhibition grounds for days before it was found possible to have them discharged. This was often done during the night, when the staff of the Royal Commission were not present; consequently cases were delivered in a building other than that to which they were addressed, and pressure was required on the part of the Royal Commission to cause the General Service Company to fulfil their contract, and remove the cases to the buildings to which they were addressed.

The various railways running into St. Louis entered into an agreement with the Exhibition Authorities for the transfer to

the Exhibition railway lines of the consignments of Exhibits at the following rates:—

For Full Car Loads.

From East St. Louis, Ill.	} For connection with the Exhibition Railroad.	{ 4 cents per 100 lbs. Minimum \$15 per car.
St. Louis, Mo.		{ 2 cents per 100 lbs. Minimum \$10 per car.

For Less Than Car Loads.

From East St. Louis, Ill., or St. Louis, Mo.	} For connection with the Exhibition Railroad.	{ 10 cents per 100 lbs. Minimum charge 50 cents.

and in addition 6 cents per 100 lbs., with a minimum charge of 50 cents for delivery on to the allotted spaces in the various Exhibition buildings, these charges being collected by the General Service Company as concessioners of the Exhibition Authorities.

The return of the Exhibits was more difficult and tedious, chiefly owing to the restrictions imposed by the Customs House. The regulations were not issued until within a few days of the closing of the Exhibition, and therefore it was not possible to anticipate the requirements, while, had timely notice been given, preparations could have been made, and thus valuable time would have been saved.

Before any goods could be repacked it was required that a form, issued by the Bureau of Expedition, should be filled up in duplicate, giving marks, numbers, and description of the cases, the steamer and port by which they had arrived, the railway by which they reached the Exhibition, the Customs House number given to the consignment at the port of arrival, the serial number, and the value. To these forms were attached a detailed invoice and three copies of a form issued by the Customs, upon which also had to be stated similar particulars, with the addition of the marks to be used upon the return journey and the estimated amount of duty. A further form—the carrier's special manifest—had also to be prepared in triplicate and attached, together with a permit to export, thus making in all a set of ten documents, the whole of which required the signature of the Surveyor of Customs or one of his subordinates, the Chief of the Bureau of Expedition, the Commissioner-General of the country from which the goods were imported, or the Bonded Shipping Agent employed.

These papers were then deposited with the Bureau of Expedition, who, after verifying the information contained therein, entered the particulars in their books and gave the papers a number. From this office they were sent to the Customs House, where they were again compared with the original entry and, if found correct, an export number was given to the consignment. In the event of any discrepancy, the papers had to be corrected, often a most difficult process, as it entailed a search through voluminous records, which were themselves often found to be faulty. The papers were then sent by the Surveyor to the Chief Inspector of Customs, and by that officer to the Customs' Chief Store Keeper, who handed them to the deputy in charge of the building in which the Exhibits were located, who in turn deputed one of his subordinates to check the goods as they were packed into the cases and make a report. The papers were then sent back through the same channels in the reverse direction, records being made by each officer. The Exhibitor or his agent was then informed that all was in order, or if any article was missing a separate entry had to be made and duty paid on the missing article, or in the event of an article being purchased by, or presented to, a public institution an entry was required stating that it was for educational purposes, which, under the United States law, exempted the article from duty.

The Deputy Surveyor of Customs, after having signed the shipping permit, sent the documents to the Chief Inspector, who transmitted them to the Bureau of Expedition, where the records of the route by which the cases reached St. Louis were traced, and the information having been ascertained, a certificate was issued stating that they were entitled to free return by rail to the port of original entry. This certificate, together with instructions as to which of the railway systems the goods were to be sent by, was transmitted to the office of the Exhibition Terminal Railway to add the number of the car and the waybill by which the goods arrived. This office then sent a demand to the railway company concerned for a car in which to load the cases; this being obtained, the General Service Company received notice to load, and when this was accomplished the Exhibitor or the Shipping Agent was called upon to pay the freight charges, and, the documents being in order, the goods left the Exhibition grounds.

The first consignments were dispatched from St. Louis in the second week in December, 1904, and reached London in the early part of February, 1905, and further consignments were dispatched at intervals as they could be prepared; but great difficulty was experienced in packing, and moving the cases when packed, owing to the intense cold which set in early in January, rendering it almost impossible for workmen to remain any length of time in the Exhibition buildings, in which no artificial heat was provided. At one time the temperature was 20° below zero Fahrenheit, and packing small and delicate articles in such weather was no easy matter. For some time during the more severe weather the railway lines were only partially available, as they were covered with frozen snow. Consequently it was the middle of March before the last consignments could be dispatched, and many of the Exhibits did not reach London until May. Amongst the latest to be delivered were some of the cases which were dispatched at the end of January or early in February, this delay being due to the disorganised condition of the American railways, caused by the inclement weather and the large accumulation at the terminal depôts.

In the case of Exhibits being returned to the country of their origin, and upon which no duty had been paid, prior to the Customs House issuing authority for the goods to be removed from the Exhibition, which had been constituted a bonded warehouse, a bond for double the amount of the estimated duty was required to be lodged by the Consignor, and this notwithstanding that the railway company who had the goods in their possession were also under bond to the United States Government for their safe custody. The Royal Commission authorised the Export Shipping Company, as their brokers, to make the entries, furnish the bonds on the goods exported, or pay the duties on goods sold, and to comply with all other formalities of the Custom House. Further entries were required at the port of shipment, one to discharge the bond, and a second to permit the goods to be placed on the ship, so that although the United States Government did not demand or receive any custom duties, fees or charges, yet a considerable outlay was occasioned by the necessity of employing Custom House brokers to make these entries and to comply with the numerous formalities.

INSURANCE.

The Royal Commission having become responsible for the Collective Exhibits formed by the Committees, it was necessary to effect insurance against risks of damage or loss. From inquiries which were instituted, it appeared that the Association at Lloyd's would be willing to grant policies which would cover wider risks and at the same time the rates quoted were lower than could be obtained from the Insurance Companies.

Mr. Edward Saunders was, therefore, instructed in the first instance to arrange for covering policies for £70,000, at the rate of seventy-five shillings per cent. on the General Exhibits, and for £20,000 at the rate of eighty shillings per cent. on Models, to cover all risks from the time the articles left the owners' possession until their return.

The owners were asked to give the value they placed upon their Exhibits, and these values were written off the covering policies from time to time, a detailed statement being prepared at a later date, and policies amounting to £42,936 on the General Exhibits, and £6,810 on the Models, were eventually issued. These policies did not include the Exhibits in the Department of Art, for the insurance of which special arrangements were made by the Art Committee (see Report on page 83); neither was any of the property of the Royal Commission, such as show-cases and fittings, included in the policies, as it was not considered necessary that these should be insured.

MOTIVE POWER, LIGHTING AND WATER.

The supply of electricity for power and light, also connection to the water mains, sewers and drains, was provided by the Department of Works of the Administration; the requirements of the Royal Commission and the British Exhibitors were, however, comparatively small, as but little machinery was shown, and the light in all the buildings was sufficiently good to obviate the requirement of artificial light, no building being open to the public after sunset, with the exception of the Electricity Building on a few evenings at the latter part of the period of the Exhibition. The Royal Commission used electric light only in the offices in the several sections, the same connections being utilized for driving desk fans during the heat of the summer. Electric motive power, the only source of power

available, was required in four sections, in two of which it was supplied gratuitously, in the third at a reduced price, and in the fourth, where the requirements were small, the current was paid for by the Royal Commission at the tariff rate.

The charges arranged by the Administration were, during the period the Exhibition was open to the public, for Incandescent lamps of 16 c.p., not exceeding 60 volts, \$7 per lamp, a proportionately less amount being charged for smaller lamps. For current to be used for motive power, Desk Fans, \$14 each; for a $\frac{1}{4}$ HP. Motor, \$20; for $\frac{1}{2}$ HP. Motor, \$40; for 1 HP. Motor, \$77; and for motors of larger than one horse-power, \$70 per horse-power. For current for arc-lamps if arranged in multiple, \$77, and if in series \$70 each. Consumers whose accounts amounted to \$175 were allowed a discount of 5 per cent. and a proportionately larger percentage upon a sliding scale up to 28 per cent. on amounts of \$3,150 and upwards; in addition to these charges \$5 had in every case to be paid for each connection to the main cables. All wiring had to be carried out by certain firms duly authorized by the Administration in accordance with rules drawn up for their guidance, and such firms were held responsible for payment of stipulated fees and for the execution of the work within the Exhibition.

Two systems of water mains were laid down by the Administration, high pressure for fire service only, and the ordinary pressure in the town mains for general use. Water was supplied by the Administration under regulations and conditions which permitted only authorized firms, who paid the Administration for the privilege, to undertake the plumbing work and connections, and these firms were charged by the Administration a fee of 10 per cent. upon the amount of their account for the work done, which covered the cost of inspection by officers appointed for that purpose; the charge for water consumed was at the rate of three cents (3 cts.) per hundred gallons, all water being furnished by meter, and accounts for the same were collected monthly.

Gas was supplied by the Laclede Gas Co. (the only Gas Company in St. Louis), who had provided a series of mains throughout the Exhibition buildings and grounds, and all work of pipe-laying or connections with these mains was undertaken by the Company only. Gas was supplied by meter at the charge of \$1.20 (5s.) per 1,000 cubic feet.

EMPTY CASES.

The removal and storage of empty packing-cases were provided for by the Administration of the Exhibition, who, under certain regulations, placed the matter in the hands of the General Service Company. In a part of the Exhibition grounds, remote from the buildings, this company erected ranges of enclosed sheds for the storage of the cases, these sheds being connected with the different Exhibition buildings by an extension of the railway lines, and by roads formed for the purpose. They were protected from fire by a system of high-pressure water mains with hydrants at frequent intervals, and regulations for the prevention of fire were strictly enforced.

The General Service Company's charge for the collection, storage and return of the cases at the close of the Exhibition was fixed at five cents per cubic foot of space occupied, Exhibitors being permitted to store the smaller inside the larger cases. It was foreseen that if the cases, for which the Royal Commission were responsible, were sent to these sheds to be indiscriminately stored with those of other nations, considerable confusion and consequent delay in the return of the cases would be occasioned. The General Service Company were therefore approached with the view to acquiring a sufficient capacity in the sheds to store the British cases separately, and an agreement was arrived at by which the Company let to the Royal Commission a portion of a shed sufficient to store 80,000 cubic feet at a rental of \$3,993.60 (£823), including the collection, storing and redelivery of the cases. The space thus acquired was divided in such a manner that the cases from each of the British Sections should be stored together by themselves, and a responsible man was appointed to supervise the work.

The arrangement generally was found to work satisfactorily, and no serious difficulty was experienced in either the collection or return of the cases, the whole of them being returned to the Section to which they belonged within three weeks of the close of the Exhibition. It was also economical as compared with the cost of similar service at former Exhibitions, and it obviated the necessity of negotiations with the Customs House, which would have been necessary had the cases been removed from the Exhibition enclosure and consequently out of the bonded warehouse and the direct control of the Customs.

PASSES.

Previous to the opening of the Exhibition, passes were issued by the Authorities upon applications signed by the Commissioner-General:—

- (1) To the Foreign Relations Committee, for passes for the Royal Commission and members of the staff.
- (2) To the Director of Exhibits, for passes for persons engaged in the work of installation of Exhibits.

All pre-Exhibition passes expired on the 29th April. Although repeated applications were made for passes for members of the staff of the Royal Commission, Exhibitors, Exhibitors' Representatives and Assistants for use after the 29th April, it was not until late in the afternoon of that day that a supply of emergency passes was delivered at the Royal Pavilion. These passes had to be promptly distributed to all working in the interests of the British Sections in order to obtain admission to the grounds on the Opening Day.

On and from the Opening Day—30th April—to the 1st December the following passes were used:—

1. Complimentary Passes.
2. Photographic Passes.
3. Workmen's Passes.
4. Trip Passes.
5. Temporary Passes.

1. *Complimentary Passes.*—These passes were issued to the Commissioner-General and members of the staff of the Royal Commission, also to the Metropolitan Police Force detailed for duty at the Exhibition. In addition to presenting these Complimentary passes at the Entrance Gates, the holders had to fill in a small slip giving name, number of pass, and number of form. The number of these passes issued was 27.

2. *Photographic Passes.*—One pass of this nature was issued free to each British Firm exhibiting, but for additional passes one dollar each was demanded by the Exhibition Authorities. No mention of such charge was made in the Regulations, and it was with considerable surprise that the Royal Commission learnt of the intention to demand payment for passes issued to British Exhibitors. It may be mentioned that the price was at

first fixed at two dollars for each pass, but in consequence of a serious protest from the Royal Commission the price was ultimately reduced to one dollar. British Exhibitors expressed their surprise at this action on the part of the Exhibition Authorities, and the Royal Commission, in order to keep faith with their Exhibitors, decided to pay for all necessary passes. The following routine had to be followed before Photographic Passes could be obtained:—A special form, giving the name and nature of the occupation of the applicant, signed on behalf of the firm requiring a pass ; countersigned by the Commissioner-General ; approved by the Chief of the Department in which the Exhibit was installed ; and then sanctioned by the Director of Exhibits: these signatures being obtained the form was taken to the Division of Admissions and Concessions, where, upon payment of one dollar for each pass, an order on the Official Photographer, together with ten temporary passes, were issued. The applicant had next to be photographed. The photograph was placed inside a cover, to which were annexed a quantity of slips, each one bearing the number of the day of the year from the date of the issue of the pass until the close of the Exhibition, one slip being torn off each day by the attendant at the turnstile. In the event of the holder of the pass requiring to obtain admission to the grounds more than once daily, it was necessary to present his pass and fill up and sign a special form for the purpose. Some of the covers issued only contained slips sufficient for the current month, and consequently had to be renewed several times.

In the middle of August the Exhibition Authorities issued an order calling for all photographic passes to be revalidated before the 1st September. This demand caused considerable trouble, mainly on account of the variations in the instructions given. It is satisfactory to record, however, that all passes issued to British Exhibitors and employees of the Royal Commission were in order by the date named.

From the 1st September the Exhibition Authorities claimed \$2 for each photographic pass, instead of one as hitherto. Against this increased charge the Royal Commission protested and the Authorities agreed to refund, at a later date, \$1 on each pass for which \$2 had been paid. The number of photographic passes issued on behalf of the British Royal Commission was 274.

3. *Workmen's Passes.*—Passes issued to workmen were

renewed weekly and were only available for one admission daily before 9 A.M. The passes took the form of long narrow cards perforated into seven slips, each slip bearing the day of the week on which admission could be gained, one slip being detached by the attendant upon entrance; the top portion of the card bore the day of the year on which the pass expired. Each pass had to be accompanied by a numbered badge, for which a deposit of \$1 each was demanded. The full amount deposited by the Royal Commission for workmen's badges was refunded at a later date. The number of workmen's passes issued averaged about fifty weekly.

4. *Trip Passes*.—Books, each containing ten single admissions, were supplied to the Royal Commission, who issued these passes to prominent British visitors, *i.e.*, Government officials and Exhibitors, whose visits to the Exhibition being short did not warrant a special pass being applied for in their favour. Great precautions were exercised in the issue of these passes, a counterfoil was kept, giving the name of the person to whom the pass was granted, the business of such person, the date of issue and at whose request the favour was demanded. These counterfoils had to be returned to the office of the Secretary of the Louisiana Purchase Exposition before further books could be obtained.

5. *Temporary Passes*.—In special cases the Director of Exhibits issued passes giving ten admissions to Exhibitors, etc., whose visits to St. Louis were of not long duration.

Four special passes giving admission to the Exhibition buildings after they were closed to the public, and the same number of passes invoking the aid of the Exhibition Guardians to the holders when presented, were issued to members of the staff of the Royal Commission.

The Exhibition Authorities furnished the Royal Commission from time to time with exit passes. These passes, when signed by the Commissioner-General, were used for presentation at the exit gates by members of the staff of the Royal Commission when taking out small parcels of personal effects.

After the 1st of December the presentation at the entrance gates of the complimentary and photographic passes was sufficient for admittance to the Exhibition grounds. The workmen's passes were renewed weekly, the same as during the course of the Exhibition. Trip passes were also available, and four applications on behalf of the Royal Commission for

temporary passes for special packers were granted. Passes to the various Exhibition buildings had also to be obtained.

In conclusion, I desire to express my sincere thanks to Mr. J. H. Cundall and Mr. E. H. Lloyd, the General Superintendents of Exhibits, for the manner in which they carried out their arduous duties. These gentlemen also acted as Secretaries to the different Departmental Committees to which reference has been made on page 163, and were responsible from the first for the collection and installation of the Exhibits, except in the Departments of Art and Education, the arrangements for which are described in the Reports of the Committees for these Departments (see pages 53 and 71).

The Assistant Superintendents in the different Departments also carried out their work in a very satisfactory manner. The names of these gentlemen are given in the list of the Staff of the Royal Commission on page 35.

C. M. WATSON.

GENERAL REGULATIONS FOR BRITISH
EXHIBITORS.

- (1) *Opening and Closing of Exhibition.*—The Exhibition will open on the 30th April, 1904, and close not later than 1st December, 1904. The Exhibition will not be open on Sundays.
- (2) *Applications for Space.*—Forms of application for space must be returned to the Secretary of the Royal Commission as early as possible, and in any case not later than 31st August, 1903. All applications will be considered by the Royal Commission, but they cannot undertake to allot the whole or any part of the space applied for—their object being to secure the best possible exhibition of British goods in each Department. *There will be no charge for space.*
- (3) *Date of Reception of Exhibits.*—Accepted exhibits will be admitted into the Exhibition from 1st September, 1903, to 9th April, 1904.
- (4) *Prohibition of Transfer of Space or Substitution of Exhibits.*—The Exhibitors of manufactured articles must be the manufacturers or producers thereof, and the country in which the article is produced will determine its nationality. No Exhibitor will be permitted to transfer his allotment, or to allow any other than his own duly accepted exhibits to be placed thereon.
- (5) *Agreement.*—A definite agreement must be entered into by each Exhibitor that the space allotted will be occupied by the 9th April, 1904.
- (6) *Labels.*—All cases containing goods for exhibition must bear special labels; full instructions thereon will be supplied to Exhibitors in due course.
- (7) *Supervision and Installation of Exhibits.*—Exhibitors must bear all expenses of conveying, delivering, arranging, installing, and removing their exhibits; and also the cost of erecting all fixtures, platforms, screens and counters, other than those supplied by the Royal Commission.

Exhibitors must personally, or by their accredited representatives, receive, unpack, and instal their exhibits and remove the same before the 1st March, 1905. Any exhibit or material not removed by that date will be considered to have been abandoned by the Exhibitor, and will be subject to removal at the cost of the Exhibitor, or to such disposition by the American Executive as may be deemed advisable. All cases must be unpacked immediately on arrival. Any cases remaining unpacked fifteen days prior to the opening of the Exhibition will be liable to be removed and stored at the cost and risk of whoever it may concern; but in no case will the American Executive or the Royal Commission be responsible for any damage which may arise, or any expense which may be incurred, in consequence of such removal. No exhibit shall be removed in whole or in part until the close of the Exhibition. The floor must not be cut without the permission of the Secretary of the Royal Commission.

- (8) *Position of Exhibits*.—Exhibitors will be required to place their exhibits so as to contribute to the general effect. The whole of the arrangements relating to show-cases, signs, notices, and all similar matters will be subject to instructions issued by the Secretary of the Royal Commission.
- (9) *Uniformity of Decoration*.—In order to ensure uniformity of decoration and general effect, no Exhibitor will be allowed to put up flags, banners, or any kind of decoration, without special permission from the Secretary of the Royal Commission.
- (10) *Partitions*.—No partitions may be erected between the stands without permission from the Secretary of the Royal Commission, nor anything put up to interfere with the sight of adjoining stands, or to impede the general view in all directions throughout the building.
- (11) *Signs and Name Boards*.—No sign or name board may be placed in such a manner as to interfere with the vista, or otherwise than parallel with the front of the stand. All signs must be uniform in style. Instruction upon this point will be issued later, and the maximum dimensions will be specified.

- (12) *Freight, etc.*—Information regarding any reduction of freight charges, etc., will be issued by the Secretary of the Royal Commission from time to time.
- (13) *Customs Duties. Forwarding of Goods.*—The buildings of the Exhibition will be treated as bonded warehouses, and goods will be forwarded from the port of entry to the Exhibition, in bond, under the ordinary regulations in force and a special customs service connected with the Exhibition. Goods for exhibition only will not be liable to duty, but on goods removed from bond the usual rates will have to be paid. Exhibitors may transmit their goods through any forwarding agents or direct to the Exhibition.
- (14) *Protection of Exhibits.*—The American Executive will take all possible precautions for the protection of exhibits, but neither they nor the Royal Commission can be held responsible for loss or damage, however caused. It is left to Exhibitors to insure their own goods should they desire to do so.
- (15) *Dangerous and Unhealthy Exhibits.*—Dangerous articles, especially those of an explosive nature, also patent medicines, nostrums, and empirical preparations whose ingredients are concealed, are excluded. Percussion caps, fireworks, matches, and similar articles will only be accepted in the form of imitations and on condition that they contain no inflammable matter. Exhibitors of unhealthy products, or of products which may cause inconvenience, must conform at all times to any measures which may be prescribed by the Royal Commission in the interests of public health and safety. Spirits or alcohols, oils and essences, corrosive substances, and such as are liable to injure other exhibits or inconvenience the public, will only be accepted provided that they are contained in such vessels of convenient size, shape, and material as may be approved by the Royal Commission. The Royal Commission reserve the right to remove at any time articles which they may deem objectionable or unsuitable for exhibition.
- (16) *Placards and Handbills.*—No printed or written placards, handbills, or descriptions, may be displayed or distributed without the permission of the Secretary of the

Royal Commission. Such permission may be withdrawn at any time.

- (17) *Opening and Closing of Exhibits.*—All show-cases, machinery, and exhibits generally must be uncovered and properly cleaned each day at least thirty minutes previous to the hour at which the Exhibition is open to the public. They must not be again covered until the closing of the building.
- (18) *Storage of Empties.*—Exhibitors must remove from the Exhibition buildings and grounds, with the least possible delay, all empty packing cases and packing materials. The American Executive are making arrangements for the collection, storage and re-delivery of cases at a moderate charge on behalf of Exhibitors who may desire to avail themselves of such facilities. Cases must be distinctly marked by the Exhibitor for the purpose of identification at the close of the Exhibition.
- (19) *Copyright.*—No work of art or object exhibited in the buildings or grounds may be drawn, copied or reproduced in any form whatsoever without the Exhibitor's written permission, countersigned by the Secretary of the Royal Commission. The American Executive may, however, allow general views to be taken and reproduced.
- (20) *Motive Power.*—Motive power will be supplied to Exhibitors at a fixed rate, which will be notified later. A limited amount of motive power will be provided free of charge under conditions which will be communicated to the Exhibitors.
- (21) *Foundations and Connections.*—Exhibitors must provide, at their own expense, all necessary foundations, connections with the water, gas, electric and steam mains, as well as exhaust pipes, drains, etc., and also provide pulleys (which must be in halves) or any intermediate gearing that may be necessary to convey power from the main shafting.
- (22) *Fencing of Machinery.*—All machinery in motion must be railed off in such a way as to protect the public and the workpeople from injury, and to the satisfaction of the Secretary of the Royal Commission and the American Executive.

(23) *Nature of Awards.*—Awards to Exhibitors will take the form of Diplomas, which will be divided into four classes :—

1. Grand Prize.
2. Gold Medal.
3. Silver Medal.
4. Bronze Medal.

No exhibit can be excluded from competition for award without the consent of the President of the Exposition Company, after a review of the reasons or motives by competent authorities hereafter to be provided.

(24) *Compliance with Instructions.*—Exhibitors, and their representatives and workmen, must comply with all instructions issued by the Secretary of the Royal Commission or his recognised representative.

(25) *Liability of Exhibitors.*—Every Exhibitor shows at his own risk in every respect, and it is a condition that he holds the Royal Commission harmless, and indemnify it against any legal proceedings, whether in the American or British Courts, arising from any injury or accident caused or occasioned by his machinery or other article exhibited by him or from any action which it may be necessary to take in enforcing compliance with the regulations. The above rule applies to companies and firms as well as to individual Exhibitors.

(26) *Co-Operation of Exhibitors regarding Regulations.*—As the above regulations are laid down solely in the interests of the general body of Exhibitors, and to ensure the satisfactory working of the British Section, the Royal Commission trust that the Exhibitors generally will co-operate in carrying them into effect.

(27) *Infringement of Regulations.*—The infringement of any of the above regulations, or any of the regulations of the American Executive, will subject the Exhibitor to the forfeiture of his space, and to the removal of his goods from the building, without any liability attaching to the American Executive, or to the Royal Commission or their representatives in any way whatsoever in consequence of such removal. The question whether any such regulations have been infringed and whether the Exhibitor's space has been forfeited and whether his

goods shall be removed is to be determined according to the sole discretion of the Royal Commission.

- (28) *Collective Exhibits*.—In the case of Collective Exhibits, in certain groups approved by the Royal Commission, financial assistance towards the cost of exhibition may be granted.
- (29) *Alteration of Regulations*.—These regulations are subject to alteration and amplification from time to time.
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REPORT ON PUBLICATIONS, PRINTING, ETC.

BY COLONEL SIR C. M. WATSON, R.E., K.C.M.G., C.B.,
Secretary of the Royal Commission.

BRITISH OFFICIAL CATALOGUE.

The regulations of the Exhibition Authorities in reference to the sale of Catalogues were as follows :—

“ An official catalogue of all exhibits will be published in English by the Exposition Company. Foreign governments, and the governments of the States, territories and districts of the United States making a collective exhibit, may publish separate catalogues of their own exhibits when recommended by the Director of Exhibits, to the President and approved by him. The sale of catalogues is reserved exclusively by the Exposition Company.”

Having in view these regulations the Royal Commission communicated with the Exhibition Authorities regarding the issue of a separate catalogue describing British exhibits. After a somewhat protracted correspondence the Authorities gave their consent to such a publication being issued, without royalty, provided neither advertisements nor illustrations were inserted. At a later date the Treasury Department of the United States Government agreed to the entry into the States of copies of the catalogue, free of duty, provided “ that the distribution is not intended as an advertisement for business firms.”

Upon receiving these satisfactory notifications, steps were taken to prepare a catalogue, giving complete descriptions of all British exhibits. Sir E. Maunde Thompson, K.C.B., I.S.O., kindly gave his valuable advice in the selection of paper and type to be used. An estimate of the cost of the printing, binding, etc., was next obtained, and, after careful consideration, the work was entrusted to Messrs. William Clowes and Sons, Limited, who eventually produced a catalogue which was highly commended by the Exhibition Authorities and all the Foreign Commissioners-General.

Having settled the preliminary form of the work, British

exhibitors were requested to send a full description of their exhibits for insertion therein—a special form being provided for this purpose. It was found impossible to lay down a fixed rule allowing each exhibitor the same number of lines, inasmuch as in some cases a few words fully described the goods to be shown, whilst on the other hand several lines were necessary to adequately describe the various exhibits.

The general classification was strictly adhered to in the compilation of the catalogue—exhibits being described under the group in which they were classified. In some instances the classification overlapped, and in order to give exhibitors every facility for having their exhibits judged by the Jury, the system of cross-references in the catalogues was resorted to, and consequently British exhibits received every attention by the Jury of Awards.

A key plan, with the spaces occupied by British exhibits marked in red, was placed at the end of the work.

A new departure was made in publishing the catalogue. Sections of the catalogue were bound up separately, each section dealing with one or more groups of the classification. The key plan was treated in a like manner. The number and description of the Sectional Catalogues were as follows :—

1. Jubilee Presents.
2. Education and Social Economy.
3. Art.
4. Engravings and Books.
5. Photography.
6. Geography and Exploration.
7. Instruments of Precision. Musical Instruments. Civil and Military Engineering.
8. Chemical and Pharmaceutical Arts.
9. Manufactures.
10. Machinery. Electricity. Transportation.
11. Agriculture. Horticulture. Forestry. Fish and Game. Physical Culture.
12. Mines and Metallurgy.
13. Key plan.

For sale in America the price of the Catalogue was fixed as follows :—

The complete work, \$1.50. Sectional Catalogues numbered 1, 2, 5, 6, 7, 8, 9, 10, 11 and 12 were sold at 10c. each, those

numbered 3 and 4, 25c. each, but eventually number 4 was reduced to 10c., and number 13 was sold at 5c.

The Departmental Catalogues for which there was the greatest demand was that of the Queen's Jubilee Presents, of which 13,482 were sold; and the Art Catalogue, 955 of which were taken by the public.

The fact that the British Catalogue was ready by the date of opening the Exhibition was very advantageous, as the General American Catalogue was not completed until some time afterwards.

The result of binding the catalogues in sections proved highly satisfactory. Had not this course been adopted it is feared that a greater expenditure would have been incurred in the production of the Catalogue. Likewise the preparation of a Key Plan, showing the location of British Exhibits in the various buildings separately from the complete Catalogue, was most useful, as it enabled visitors interested in British Exhibits to find them without difficulty, and also obviated the necessity of being burdened with a quantity of printed matter whilst visiting the different sections.

GENERAL PRINTING.

Besides the preparation and printing of the Catalogue it was necessary to have various forms printed. These forms consisted chiefly in requesting particulars from Exhibitors, and also in circulating information received from time to time from the Exhibition Authorities. There were also a number of forms printed for office use. The following is a list of these forms:—

FORM No. 1.—For filing correspondence. (For office use only).

FORM No. 2.—Monthly Salaries List. (For office use only).

FORM No. 3.—Weekly Wages List. (For office use only).

FORM No. 4.—Travelling and Incidental Expenses and Subsistence Allowance. (For office use only).

FORM No. 5.—Petty Cash and other disbursements incurred by Members of the Staff. (For office use only).

- FORM No. 6.—Instructions for Departmental Committees.
Rules laid down for the guidance of the Committees in order that they might work in harmony one with the other.
- FORM No. 7.—Synopsis of the Classification of Exhibits.
This form gave particulars of all Groups, omitting the sub-division of classes.
- FORM No. 8.—Letter of acknowledgment.
- FORM No. 9.—Letter referring documents to Committees.
- FORM No. 10.—First letter to intending Exhibitors, informing them of the appointment of the Royal Commission.
- FORM No. 11.—Second letter to intending Exhibitors in which the Royal Commission desired to ascertain their views in reference to exhibiting.
- FORM No. 12.—Speech of H.R.H. the Prince of Wales, delivered at the first meeting of the Royal Commission held at Marlborough House, 28th April, 1903.
- FORM No. 13.—List of Members of the Royal Commission and Members of Committees.
- FORM No. 14.—Letter enclosing cheque in payment of accounts.
- FORM No. 15.—Letter of acknowledgment.
- FORM No. 16.—Letter of acknowledgment on special subjects.
- FORM No. 17.—Speech of H.R.H. the Prince of Wales delivered at the Royal Academy Banquet, 2nd May, 1903.
- FORM No. 18.—Application for space, on which Exhibitors were asked to make known their requirements as regards Space in the Exhibition.
- FORM No. 19.—Letter covering form of application for Space.
- FORM No. 20.—Particulars requested from Exhibitors in the Art Section.

FORM No. 21.—Letter to Exhibitors reminding them of the last date for receiving application for space.

FORM No. 22.—Letter acknowledging receipt of application for space.

FORM No. 23.—Particulars requested from exhibitors in the Applied Art Section.

FORM No. 24.—Letter to proposed Exhibitors in the Art Section.

FORM No. 25.—Letter to proposed Exhibitors in the Applied Art Section.

FORM No. 26.—Application and General Regulations for contributors to Collective Exhibits.

FORM No. 27.—Railway Certificate — Outward journey.
Upon presentation of this form, duly filled up, to the Railway Company, Exhibitors' goods were carried at half rates at owner's risk to the Port of Embarkation.

FORM No. 28.—Letter to proposed Exhibitors in the Education Section.

FORM No. 29.—Letter to proposed Exhibitors in the Chemical Section.

FORM No. 29A.—Form of application for space in the Chemical Section.

FORM No. 30.—Monthly account of receipts and expenditure. (For office use only).

FORM No. 31.—Invitation to proposed Exhibitors in the Pictorial Photographic Section.

FORM No. 31A.—Letter accepting invitation mentioned in Form 31.

FORM No. 32.—Letter covering "Demand for Labels."

FORM No. 32A.—Demand for Labels—asking Exhibitors to state the number of labels, English and American, required for forwarding exhibits.

FORM No. 32B.—Instructions issued to Exhibitors as to the Labelling and Marking of cases containing exhibits.

FORM No. 33.—Letter asking Exhibitors to fill up and return form enclosed with a full description of their exhibit for the British Official Catalogue.

FORM No. 33A.—Form as mentioned in No. 33.

FORM No. 34.—Application and General Regulations for contributors to the Lace and Embroidery Collection.

FORM No. 35.—Letter thanking intending Exhibitors in the Applied Art Section who sent particulars of their works for submission to the sub-Committee.

FORM No. 36A.—Notes for the Guidance of Exhibitors in
36B. the Education Section.

FORM No. 37.—Letter issued by the sub-Committee to Chemical Exhibitors stating the section of show-case that had been allotted, and enclosing Plan, Elevation, Description and other particulars.

FORM No. 37A.—Notes and suggestions to Exhibitors in the Chemical Section as to the manner in which exhibits will be displayed.

FORM No. 37B.—Sent with preceding form asking for description of articles and values for insurance.

FORM No. 38.—Letter urging Exhibitors to despatch their exhibits with all possible speed.

FORM No. 39.—Letter issued by the Art Committee to Artists and others inviting them to contribute specific works.

FORM No. 40.—Extracts from the General Regulations issued by the St. Louis Exhibition Authorities.

FORM No. 41.—Letter issued to Exhibitors in the Art Section in respect to collecting works.

FORM No. 42.—Invoice for shipping and Customs purposes.

FORM No. 43.—Letter advising Exhibitors in the Chemical Section to furnish authoritative information for the guidance of the Jury.

FORM No. 44.—Asking Exhibitors in the Art Section to send some Biographical Notes relating to the Artists represented, for publication in the British Official Catalogue.

FORM No. 44A.—Form referred to in No. 44.

FORM No. 45.—Subsistence Allowance. (For office use only).

FORM No. 46.—Wages List. (For office use only).

FORM No. 47.—Annual account of receipts and payments. (For office use only).

FORM No. 48.—Monthly account of Sub-Accountant. (For office use only).

FORM No. 49.—Monthly statement of transactions of the Sub-Accountant's Officers. (For office use only).

FORM No. 50.—Letter to the Exhibitors giving date of the meeting of the International Jury.

FORM No. 51.—Letter to Exhibitors requesting information for the Jury.

FORM No. 51A.—Letter to Exhibitors requesting information for the Jury as regards Collaborators.

FORM No. 52.—Letter to Exhibitors in the Education Section requesting information regarding the disposal of their Exhibits.

FORM No. 53.—Railway Certificate—Homeward Journey. Upon presentation of this form, duly filled up, to the Railway Company, Exhibitors' goods were carried at half rates at owner's risk from the sea-board in England to the Exhibitor's address.

FORM No. 54.—Certificate for presentation to the Customs Authorities at Liverpool upon the return of exhibits from St. Louis.

FORM No. 55.—Letter to Exhibitors notifying the Awards made by the International Jury.

FORM No. 56.—Letter to Exhibitors notifying the Awards made by the International Jury as regards Collaborators.

FORM No. 57.—Monthly Schedule of payments recorded by the Accounting Officer. (For office use only).

FORM No. 58.—Receipt used in connection with payments received by the sales of Collective Exhibits.

FORM No. 59.—Letter to Exhibitors transmitting reproductions of reverse sides of Medals.

FORM No. 60.—Letter transmitting Commemorative Diplomas.

FORM No. 61.—Letter transmitting Diplomas to Exhibitors.

A complete set of the forms has been filed, as they may prove of use in the case of future exhibitions.

Many of these forms were printed by the Stationery Office, but in cases where urgency was essential the work was given to Messrs. Clowes & Sons, Limited.

In addition, a pamphlet, giving the Royal Commission, List of the Members of the Committees, the Complete Official Classification of Exhibits and General Regulations for British Exhibitors, together with a key plan showing the location of the principal Exhibition Buildings, was printed for general circulation; and at a later date a re-issue of this work containing additional information for Exhibitors, such as particulars regarding Traffic arrangements, Protection of Patents, extracts from the General Regulations of the Exhibition Authorities and an Index to the General Classification of Exhibits, was published. The issue of the pamphlet proved to be of the greatest assistance to Exhibitors.

Large labels to be placed on packing cases were issued to all Exhibitors. On these was a representation of the Union Flag, printed in colours, and an indication of the Exhibition building to which each case was to be sent. These labels proved of great use, as they enabled British packages to be recognised at once.

A small amount of printing had to be executed at St. Louis, but the prices there were so high that as far as possible everything was obtained from London.

The general arrangements for printing were in charge of Mr. H. Langridge, the Chief Clerk to the Royal Commission. He had also charge of correspondence and of the registry of papers. He carried out his duties in a very satisfactory manner.

STATIONERY AND SMALL STORES.

These, as a general rule, were obtained from the Stationery Office and the cost charged to the account of the Royal Commission.

C. M. WATSON.

PART II.

REPORT ON THE WORK OF THE INTERNATIONAL JURY IN THE BRITISH SECTION.

BY COLONEL SIR C. M. WATSON, R.E., K.C.M.G., C.B.,

Secretary of the Royal Commission.

THE regulations governing the system of awards, a copy of which is attached to this Report, may be summarised as follows: The total number of Jurors on the International Jury of Awards was approximately 2 per cent. of the total number of exhibitors, each nation having fifty exhibitors being entitled to representation. In the case of foreign countries, the nominations for the Jury were made by the Foreign Commissioners.

There were three degrees of Jury: The Group Jury, the Department Jury and the Superior Jury.

Each Group Jury was composed of jurors and alternates, the latter only having a vote when taking the place of absent jurors. The duties of the Group Juries (the official classification comprising 144 groups), consisted in carefully examining all exhibits pertaining to each group, and drawing up recommendations for awards. The decimal scale system was used in judging the merits of exhibits, 100 representing perfection. Of this, a maximum of 25 points was awarded for the value of the product, 25 points for skill and ingenuity, 10 points for the merit of the installation, 10 points for its magnitude; 10 points for quality or cheapness; 10 points for completion of installation within the required time; 5 points for the length of time the exhibitor had been in business, and 5 points for the number and character of awards he had received at previous Exhibitions. The scale of markings used in determining the final merits of an exhibit and fixing the award, were as follows:

60 to 74	.	.	.	.	Bronze Medal.
75 to 84	.	.	.	.	Silver „
85 to 94	.	.	.	.	Gold „
95 to 100	.	.	.	.	Grand Prize.

The above was the official marking, but it was not rigidly

followed in the case of all the Juries. A copy of the Regulations for Awards is annexed, see page 212.

It will be observed that no Honourable Mention awards were made. Exhibits withdrawn from competition, in virtue of one of the jurors being connected with the said exhibit, or for any special reason alleged by the exhibitor and accepted by the Exhibition Authorities, were not given a Diploma. This was a departure from the practice of former Exhibitions, as was also the omission of the Honourable Mention Diploma, which had previously been the lowest grade award. In addition to the awards prescribed for exhibitors, awards were made to inventors, designers, or artisans who had collaborated with the exhibiting firm in connection with their exhibit, in accordance with the precedent set at the Paris Exhibition of 1900.

According to the General Regulations each Diploma will be accompanied by a bronze medal, and different designs have been adopted for the bronze medals to accompany each class of award. This is a variation on the practice adopted at the Paris Exhibition of 1900, when the bronze medals issued with the Grand Prize, Gold Medal, Silver Medal, and Bronze Medal Diplomas were all alike in size and design.

Exhibits were only entitled to receive one award in any group, but could be entered in different groups, and receive an award in each one. In the case of Collective Exhibits, the names of the contributors will be entered on the Diploma, a copy of the Diploma being made out for each participant. A regular exhibitor was entitled to receive a separate award, although his exhibit was joined with others in a single installation, thus establishing a distinction between a Collective Exhibit and a collected one.

The duties of the Department Juries, there being fifteen departments according to the official classification, a copy of which is annexed, were to consider carefully the reports of the Group Juries, and harmonise any differences that might exist between the nature of the recommendations for the several groups in the department; and also to examine and judge exhibits which the Group Juries had not been able to visit within the time prescribed for their work. These Department Juries were composed of the Chairmen and Vice-Chairmen of the Group Juries, one being a foreigner, and the other a citizen of

the United States, together with one member of the Directorate of the Louisiana Purchase Exposition, and a representative of the Board of Lady Managers.

The third degree of Jury, the Superior Jury, consisted of the President of the Exposition, the Director of Exhibits, a citizen of the United States appointed by the Louisiana Purchase Exposition Commission, the Commissioners-General of the foreign countries occupying with exhibits the largest amount of space, the Chairmen and Vice-Chairmen of the Department Juries, one of whom was a foreigner, and the other a citizen of the United States, the Chiefs of the various Exhibit Departments, and a representative of the Board of Lady Managers.

The duties of the Superior Jury were to determine finally and fully the awards made to exhibitors and their collaborators, in all cases formally presented for its consideration.

The deliberations of all Juries were strictly secret.

The original intention that the jury work should commence thirty days after the opening of the Exhibition was frustrated, owing to the delays in the reception and installation of exhibits, and it was finally decided to postpone the work until the beginning of September, after the heat of the summer had passed.

The Royal Commission, previous to the opening of the Exhibition, approached representatives of Great Britain on the subject of their acting on the Jury; in all cases the names of these gentlemen were chosen by the Committees of the Royal Commission appointed for dealing with the exhibits of the various Departments, the jurors for the Liberal Arts Department being selected, for instance, by the Liberal Arts Committee, and similarly in the other Departments.

Owing to the postponement of the work of the Jury, the original list of British Jurors was somewhat modified, as some of the gentlemen who would have been able to come in the spring were unable to undertake the work in the autumn.

GROUP JURIES.

The list of the British Jurors finally appointed for the Group Juries is specified in the table on the following page.

The groups with which these gentlemen were particularly requested to deal, in which the British exhibits were most

numerous and important, are specified in the following list against their names :—

Group.	Subject.	Name.	Additional Subjects attended to by the Juror.
15	Typography .	Cyril Davenport	{ Also for Publications.
16	Photography .	J. Craig Annan.	
18	Geography . .	Maj.-Gen. J. Waterhouse	{ Also for Instruments of Precision, and for Photography.
23	{ Chemical and Pharmaceutical Arts . . }	Walter F. Reid.	
23	„	H. J. Helm.	
26	{ Civil Engineering . . . }	L. F. Vernon-Harcourt .	{ Also for Models for Public Works.
37	{ Decoration and Fixed Furniture . . . }	F. Litchfield	{ Also for Household Furniture.
45	Ceramics . .	Gilbert R. Redgrave.	{ Also for Textile Plant, Processes and Fabrics.
50	Textiles . .	J. M. Campbell	
57	Silk Fabrics .	J. O. Nicholson.	{ Also for Clothing Industries.
58	{ Lace and Embroidery . . }	A. Blackborne	
71	{ Applications of Electricity . }	Dr. C. V. Drysdale . .	{ Also for the whole Electrical Department.
75	{ Mercantile Marine . . . }	F. E. Cuming	{ Also for Land Transport.
86	{ Preparation of Foods . . }	C. H. Waterous.	{ Also for Other Exhibits in Horticulture and Forestry.
108	Trees and Shrubs	H. J. Elwes	
116	{ Ores and Minerals . . . }	Professor H. Bauerman.	{ Also for Mines and Metallurgy.
120	{ Hunting Equipment . . . }	Captain P. H. Atkin. .	{ Also for Products of Hunting.

Owing to the expense connected with the work of these Jurors, it was impossible to appoint as many British representatives on the International Jury as Great Britain was entitled to, in virtue of her participation; consequently these gentlemen

were requested to act as alternates in several groups of the classification kindred to the one to which they had been specially appointed. For instance, Major-General Waterhouse took charge of groups 18 and 19; Mr. Vernon-Harcourt of Groups 25, 26 and 27; Mr. Litchfield of Groups 37, 38, 41, 42 and 43; Mr. Redgrave of Groups 45, 46 and 48; Mr. Campbell of Groups 50 to 56; Mr. Blackborne of Groups 58 to 61; Dr. Drysdale of the whole of the Department of Electricity; Mr. Cuming of the Department of Transportation; Mr. Elwes of the Departments of Forestry and Horticulture; Professor Bauerman of the Department of Mines and Metallurgy, and Captain Atkin of the Department of Fish and Game.

In this manner, and also because in many cases various Groups of the Classification were amalgamated and placed under the jurisdiction of a single group jury, it was possible for a limited number of British Jurors to give the necessary attention to British exhibits in all the various groups, with excellent results.

India, Canada, New Zealand and Ceylon appointed their own Jurors, independently of the British Royal Commission.

A fixed sum of £150 per capita was given to British Jurors to cover travelling and all expenses during their sojourn in St. Louis. No limit of time was specified for their work, but they were given to understand that their services would probably be required for a period of from 3 to 4 weeks. It was subsequently decided to grant an additional sum of £25 to each Juror who had been detained in St. Louis for a longer period by work on the Department Jury, and a further additional sum of £25 to the Juror whose stay had been again extended by reason of his work on the Superior Jury.

All the British Jurors came out from England specially for this work, with the exception of Captain P. Atkin and Mr. Waterous. Captain Atkin, as representative of the Education Committee on the salaried staff of the British Royal Commission, was already stationed in St. Louis, and consequently received no extra remuneration for his services. In the case of Mr. Waterous, who came from Canada, a special arrangement was made, by which he received travelling expenses from Canada, and a daily allowance of £2 2s. for the time during which he was engaged on the work of the Royal Commission. His appointment was made from the St. Louis Office, as it was

found necessary to secure a British representative for Group 86, in which Great Britain had entered a very important exhibit.

In accordance with the decision of the Royal Commission, the Departments of Education, Art and Social Economy, were withdrawn from competition. The Education Juries, however, made strenuous efforts to induce the Royal Commission to allow their official exhibits to be judged by them for awards, but as it was impossible to accede to their request, the Juries expressed "their regret that the exhibits of Great Britain and Ireland had not been in competition for awards," and to indicate their sense of the great importance and valuable nature of these exhibits, they recommended a Grand Prize to the Education Committee of the British Royal Commission in each of the 8 groups of the Department of Education.

Similarly, the Jury of the Department of Social Economy expressed their regret that these exhibits had been withdrawn from competition, and recommended a Grand Prize to the Education Committee of the British Royal Commission for its collective exhibits in all the groups of that Department.

In the case of the Art Department, the Department Jury also regretted the withdrawal of the exhibits from competition, but recommended the grant of special commemorative diplomas to the following gentlemen who had been associated with the organisation, collection and installation of these Works of Art:

Fine Art Section.

SIR EDWARD J. POYNTER, BART., P.R.A., H.R.S.A., Chairman of the Art Committee of the British Royal Commission.

FRED. A. EATON, Honorary Secretary and Member of the Art Committee of the British Royal Commission.

SIR ISIDORE SPIELMANN, F.S.A., Honorary Secretary and Member of the Art Committee of the British Royal Commission.

E. J. GREGORY, R.A., P.R.I., for installation of Collection.

ALFRED PARSONS, A.R.A., for installation of Collection.

Applied Art Section.

WALTER CRANE, R.W.S., P. Arts and Crafts Exhibition Society, Chairman of the Applied Art sub-Committee of the British Royal Commission.

EDWARD S. PRIOR, Honorary Secretary of the Applied Art sub-Committee of the British Royal Commission.

HALSEY RICARDO, for installation of Collection.

Special forms were drawn up by the American Exposition Authorities for the information of the Jury. Anticipating, however, that these would not be supplied in time, the British Royal Commission issued forms of their own direct to British exhibitors. Most of these forms were returned to St. Louis in duplicate, filled in with the required particulars by the Exhibitors, and one copy was given to the British Juror for the group to which it belonged, and the other was retained at the office for reference.

As anticipated, the American forms were supplied by the Exhibition Authorities at a very late date, thus leaving but a small margin of time for the information required by the forms to be copied, or condensed upon them. In those instances where the forms had not been returned by the exhibitor, the information for the American Authorities was obtained from the entries in the British Official Catalogue.

Copies of the British Official Catalogue were supplied to each British Juror, and, in cases where desired, copies were distributed to each member of the Jury. Each Juror was provided by the American Exhibition Authorities with a badge and a pass admitting him into the Grounds, a special badge being supplied in addition to members of the Superior Jury.

The work of the Jury commenced on September 1st, by which time most of the British Jurors had arrived and reported themselves. Special rooms in the various Exhibit buildings were reserved for the work of the Group Juries, and a room in the British Royal Pavilion was set aside for the use of British Jurors, and for the clerical and other work connected with the business of the Jury.

Although every precaution was taken by the Royal Commission to see that exhibitors received due notice of the examination of their exhibits by the Juries, the latter were in many instances remiss in notifying their intentions. The American Exhibition Authorities were supposed to send notifications of examination in advance, but they frequently failed to do so, giving rise to justifiable criticism by exhibitors or their representatives, who were naturally anxious to be present, in order to explain the merits of their exhibits to the Jurors.

With the object of arriving at some understanding as to procedure and common action, a meeting of British Jurors was convened on September 3rd at the British Royal Pavilion, at which the following attended:—

The Commissioner-General for Great Britain, Mr. J. Craig Annan, Captain P. Atkin, Professor H. Bauerman, Mr. A. Blackborne, Mr. J. M. Campbell, Mr. Cyril Davenport, Dr. C. V. Drysdale, Mr. L. F. Vernon-Harcourt, Mr. H. J. Helm, Mr. F. Litchfield, Mr. J. O. Nicholson, Mr. Gilbert R. Redgrave, Mr. Walter F. Reid, Major General J. Waterhouse, and Mr. L. Serrailier, Secretary for the Jury.

It was decided at this meeting to arrange that the examination of British exhibits should not take place without due notice being given to the exhibitors, but, as already stated, this very desirable rule was not adhered to in all cases.

The question of the penalty clause for late exhibits was discussed, but the general opinion seemed to be that although the Exhibition was not ready on the opening day, sufficient proof could not be adduced to enforce any alteration in the scale of markings provided in the rules and regulations for awards. The matter was, therefore, left to the discretion of each Jury.

It was unanimously decided also to follow the Paris Exhibition precedent, and request each Juror to draw up a report of the exhibits of his group for publication, the form of the report being left to the discretion of each Juror, so that he might confine it to British Exhibits pure and simple, or enlarge it by establishing a comparison of these with foreign exhibits. These reports are annexed.

On the conclusion of the work of the Group Juries, towards the middle of September, the British Jurors were asked before their departure to mention cases of omission or injustice with regard to the awards, which had come to their knowledge. In most instances, however, they expressed satisfaction with the findings of the Juries, but where any inadequacy was pointed out, the matter was placed in the hands of the Department Jury to which it referred.

Several of the British Jurors before leaving St. Louis, left confidential lists of the awards to British Exhibitors in their groups, which considerably facilitated the work of the Royal Commission, by enabling any errors or alterations to be detected when the Department Juries revised the lists.

DEPARTMENT JURIES.

The following are the British Jurors who served on the Department Juries, in virtue of their election either as Chairmen or Vice-Chairmen of the Group Juries of which they were original members :—

Department.	Name.	Remarks.
Liberal Arts.	Maj.-Gen. J. Waterhouse	{ Vice-Chairman, Group 18. (Geography.)
	Walter F. Reid	{ Vice-Chairman, Group 23. (Chemistry.)
	L. F. Vernon-Harcourt .	{ Vice-Chairman, Group 26. (Civil Engineering.)
Manufactures	F. Litchfield	{ Vice-Chairman, Group 37. (Fixed Decoration and Furniture.)
	J. M. Campbell	{ Vice-Chairman, Group 50. (Textiles.)
Electricity	Dr. C. V. Drysdale . . .	{ Vice-Chairman, Group 71. (Applications of Electricity.)
Transportation	F. E. Cuming	{ Chairman, Group 75. (Mercantile Marine.)
Agriculture	C. H. Waterous	{ Vice-Chairman, Group 86. (Preparation of Foods.)
Horticulture	H. J. Elwes	{ Vice-Chairman, Group 108. (Trees and Shrubs.)
Mines and Metallurgy	Professor H. Bauerman.	{ Vice-Chairman, Group 116. (Ores and Minerals.)
Fish and Game	Captain P. Atkin	{ Vice-Chairman, Group 120. (Hunting Equipment.)

A meeting of the Foreign Commissioners-General was convened, with the object of arriving at some understanding regarding the Chairmanships and Vice-Chairmanships of the Group Juries, (of which 50 per cent. were reserved for the foreigners), so that the requirements of the Foreign Commissions should be met without clashing. This meeting was held on August 31st, and the Commissioners mentioned in table on next page were present.

A list of the various groups, with an indication of the country for which the Chairmanship or Vice-Chairmanship should be reserved, was drawn up by mutual agreement between the Foreign Commissioners-General present, and a letter, signed by them collectively, requesting that effect be given to their desires,

was sent to the President of the Exhibition Administration. The result of this meeting was on the whole satisfactory, since effect

Country.	Name.	Remarks.
Austria . . .	Adalbert R. von Stibral.	{ Representing the Com- missioner-General.
Belgium . . .	C. Spruyt	
Ceylon . . .	Hon. Stanley Bois.	{ Representing the Com- missioner-General.
China . . .	Francis A. Carl	
France . . .	Georges Gerald.	{ Representing the Com- missioner-General.
Germany . . .	Dr. E. Wagner	
Great Britain .	Col. C. M. Watson.	{ Representing the Com- missioner-General.
Holland . . .	Gerrit H. Ten Broek.	
Hungary. . .	Dr. G. de Szogyeny.	
India	R. Blechynden.	
Italy	G. Branchi.	
Portugal . . .	Viscount de Alte.	
Sweden . . .	Dr. N. G. W. Lagerstedt.	

was given in nearly every case by the American Exhibition Authorities to the suggestions of the Foreign Commissioners-General.

SUPERIOR JURY.

The first meeting of the Superior Jury took place on October 1st.

The following table indicates the representation of the foreign countries on the Superior Jury :—

Country.	Commissioners-General.	Others.	Total.
Austria	1	1	2
Belgium	1	1	2
Brazil	1	1	2
Bulgaria	1	0	1
France	1	3	4
Germany	1	3	4
Great Britain	1	2	3
Holland	0	1	1
Hungary	1	0	1
Italy	1	1	2
Japan	1	2	3
Mexico	1	0	1
Sweden	1	0	1
United States	0	35	35
	12	50	62

(including
Secretary.

Those representing Great Britain were Colonel Watson, as Commissioner-General; Mr. W. F. Reid, and Captain P. Atkin.

The following were the members of the Superior Jury:—

President.

David R. Francis . . . { President of the Louisiana Purchase
Exposition.

Vice-Presidents.

Frederick J. V. Skiff . . . United States, Director of Exhibits.
Wilbur F. Boyle . . . " "
Georges Gerald . . . France, Commissioner-General.
Dr. Theodor Lewald . . . Germany, " "

Secretary.

John H. McGibbons, A.M. . .

Members.

Adalbert Ritter von Stibral . . Austria, Commissioner-General.
Edwin Gilbert Cooley . . . "
Jules Carlier . . . Belgium, " "
Charles Morisseaux . . . "
General Francisco M. de Sousa } Brazil, " "
Agiuar . . . }
Dr. J. C. Alves de Lima . . . "
B. M. Mattheef . . . Bulgaria, " "
G. Kester . . . France.
Dr. Mederic T. de Gerin . . . "
I. Mabillean . . . "
F. C. Froelich . . . Germany.
Dr. H. Muthesius . . . "
Karl Steinbiss . . . "
Colonel C. M. Watson, R.E., } Great Britain, " "
C.B., C.M.G. . . . }
Captain P. Atkin . . . " "
Walter F. Reid . . . " "
Willy Martens . . . Holland.
George de Szogyeny . . . Hungary, " "
G. Branchi . . . Italy, " "
Dr. Guido Biagi . . . "
Seiichi Tejima . . . Japan, " "
Fusaji Goto . . . "
H. Shugio . . . "
Albino R. Nuncio . . . Mexico, " "
Dr. N. G. W. Lagerstedt . . . Sweden " "
Milward Adams . . . United States.
Dr. Tarleton H. Bean . . . " " Chief of Department.
Nicholas M. Bell . . . " "

Norman J. Colman	United States.		
E. G. Cowdery	" "		
Charles R. Dodge	" "		
F. E. Drake	" "		
W. E. Goldsborough	" "	Chief of Department.	
James H. Gore	" "		
R. J. Gross	" "		
Dr. J. A. Holmes	" "	" "	
Major J. W. Howard	" "		
Milan H. Hulbert	" "	" "	
Professor Halsey C. Ives . .	" "	" "	
Dr. J. H. Long	" "		
E. O. Lyte	" "		
Dr. W. J. McGee	" "	" "	
Colonel Charles F. Mills . .	" "	" "	
Mrs. Philip N. Moore	" "	Board of Lady Managers.	
Thomas M. Moore	" "	Chief of Department.	
Colonel J. A. Ockerson . . .	" "	" "	
George W. Parker	" "		
Lieut. W. V. N. Powelson, } U.S.N. }	" "		
Howard J. Rogers	" "	" "	
A. L. Shapleigh	" "		
Willard A. Smith	" "	" "	
Walter B. Stevens	" "	{ Secretary of the Louisiana Purchase Exposition.	
J. E. Sullivan	" "	Chief of Department.	
Professor L. R. Taft	" "		
Frederic W. Taylor	" "	" "	
William H. Tolman	" "		

The work of the Superior Jury consisted in adjusting differences, and considering the recommendations of the Department Juries, and also in dealing with appeals.

The official regulations provided that notification of the awards should be made to an exhibitor, so that he might, within three days after that date, file written notice with the President of the Superior Jury of his intention to appeal, if he considered the award were inconsistent or unjust. Such a regulation was practically inviting appeals, and these were so numerous that the Superior Jury was compelled to constitute six standing boards of reference, representative of the different Departments, grouped as follows:—

Board 1.—Education, Liberal Arts and Transportation.

„ 2.—Art.

„ 3.—Manufactures, Social Economy and Live Stock.

- Board 4.—Agriculture, Horticulture and Physical Culture.
,, 5.—Machinery, Electricity and Mines and Metallurgy.
,, 6.—Forestry, Fish and Game, and Anthropology.

The membership of these boards consisted of the Chairmen and Vice-Chairmen of the respective Department Juries. The function of these boards was to deal with appeals for revision, with which the Superior Jury as a body had been unable to cope. Considerable difficulty was experienced by the Royal Commission in obtaining the results of the recommendations of awards by the Department Juries, and delays occurred which would not have been the case had the organisation of this part of the work by the American Exhibition Authorities been more perfect.

The various exhibit Departments appear to have each had different systems of their own in drawing up the lists. Instead of supplying in every instance a full official typewritten list to the Foreign Commissioners of awards made to their exhibitors, the American Exhibition Authorities merely allowed the representatives of the Foreign Commissions to copy out the information for themselves at the temporary offices of the Superior Jury, thus entailing additional risk of mistakes.

The omissions and appeals for revision, however, could not all be dealt with by the Boards of Reference, as the work of the Superior Jury had, by the regulations, to be completed by the 15th of October, on which date the Jury ceased to meet. A committee consisting of the President and the four Vice-Presidents of the Superior Jury was therefore constituted to continue the work of the Superior Jury, in accordance with the Exhibition regulations.

Notices of their awards were duly posted to British exhibitors from the St. Louis offices of the British Royal Commission as soon as they were definitely decided, and a list was forwarded to the London office for publication in the newspapers of the United Kingdom.

AWARDS.

On the following page is a statistical table of the awards granted to British Exhibitors and collaborators in the various Departments of the Exhibition.

The detailed list of awards is given at page 387.

It is specially satisfactory that so high a proportion of superior awards were given, as it shows that the British Exhibits were regarded by the Jury as having a high degree of excellence.

Department.	Grand Prizes.	Gold Medals.	Silver Medals.	Bronze Medals.
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Awards to Exhibitors.

Education	8
Liberal Arts	53	84	54	51
Manufactures	26	53	34	17
Machinery	2	...	4	...
Electricity	3	14	3	...
Transportation	2	6	10	5
Agriculture	11	19	9	4
Horticulture	5	8	5	...
Forestry . . . . .	...	3	2	...
Mines and Metallurgy	8	12	3	...
Fish and Game	4	5	5	...
Anthropology	3	...	...	...
Social Economy	1	...	...	...
Totals	126	204	129	77

Awards to Collaborators.

Liberal Arts	5	16	14	5
Manufactures	1	19	19	48
Electricity	1	3	3	...
Transportation . . . . .	...	...	...	1
Horticulture . . . . .	...	2	...	...
Mines and Metallurgy . . . . .	...	3	2	...
Totals	7	43	38	54

Total awards of all grades to Exhibitors 536

“ “ “ “ “ “ Collaborators 142

Grand Total 678

On the termination of the Jury work, a circular letter was addressed to all the British Jurors, thanking them for the great assistance they had rendered to the Royal Commission in this very important branch of the work in connection with the Exhibition. They had travelled a long distance, in some cases at considerable personal inconvenience, and devoted themselves with the greatest energy to the fulfilment of their duty in the warm climate of St. Louis.

Mr. Lucien Serrailier acted as Secretary for the work of the

British Jurors, and carried out his duties in a very satisfactory manner. As is well known to all who have been connected with exhibitions, the labour in connection with the Juries and Awards is considerable, and involves a great deal of correspondence, all of which was in charge of Mr. Serrailier, who had acted in a similar position at the Paris Exhibition of 1900. The experience that he had gained there was of the greatest advantage in the case of the St. Louis Exhibition.

The relations of the Royal Commission with the Exhibition Authorities as regards the Jury work was cordial throughout, and in connection with this I would like especially to mention the names of Mr. Frederick J. V. Skiff, the Director of Exhibits, and Mr. J. H. McGibbons, the Secretary of Awards, on whom a large proportion of the work devolved.

The total cost of the work of the Jury to the Royal Commission was £2,537, including the allowances and travelling expenses of Jurors, clerical assistance, etc.

In conclusion it may be remarked that the whole of the Jury work proceeded smoothly, and not only did the British Jurors express satisfaction with the impartiality of their foreign colleagues in the recommendations for Awards, but the Exhibitors themselves and their representatives appear to have been fully satisfied.

C. M. WATSON.

RULES AND REGULATIONS GOVERNING THE SYSTEM OF AWARDS.

1. The total number of jurors in the International Jury of Awards shall be approximately two per centum of the total number of exhibitors, but not in excess of that number, and each nation having fifty (50) exhibitors, or more, shall be entitled to representation on the Jury. The number of jurors for each art or industry and for each nationality represented, shall, as far as practicable, be proportional to the number of exhibitors and the importance of the exhibits.

Of this selected body of International jurors three graded juries will be constituted : One, the general organisation of group juries ; two, department juries ; three, a superior jury.

2. Each Group Jury shall be composed of jurors and alternates.

The number of alternates shall in no case exceed one-fourth of the number of jurors, and they shall have a deliberative voice and vote only when occupying the places of absent jurors.

3. The United States jurors and alternates of the Group Juries shall be nominated by the Chiefs of Departments to which the respective groups belong. The jurors and alternates of the Group Juries representing foreign countries and the United States insular possessions shall be nominated by the Commissioners of such countries.

The Louisiana Purchase Exposition Company shall certify to the Board of Lady Managers the numbers of groups in which the exhibits have been produced in whole, or in part, by female labour ; to each of the groups so certified the Board of Lady Managers may appoint one juror and one alternate to that juror ; such appointees, when confirmed, shall have the privileges and be amenable to the regulations provided for other jurors and alternates.

All the above nominations shall be made not later than August 1st, 1904, except that nominations made to fill vacancies may be made at any subsequent time.

Jury nominations made by Commissioners of foreign

countries shall be forwarded to the President of the Louisiana Purchase Exposition Company.

Nominations made by Chiefs of Departments, and by the Board of Lady Managers, shall be submitted to the Director of Exhibits, and when approved he shall transmit them to the President of the Exposition Company.

The nomination of group jurors and alternates, when approved by the President of the Exposition, shall be transmitted to the President of the Louisiana Purchase Exposition Commission for the approval of that body.

These nominations having been considered and confirmed by the authorities, as provided by Section 6 of the Act of Congress relating to the approval of the awarding of premiums, the appointments to the international jury shall be made in accordance with Section 6 of Article XXII of the official Rules and Regulations of the Louisiana Purchase Exposition Company.

4. Each Group Jury shall choose its own officers, consisting of a Chairman, a Vice-Chairman and a Secretary.

Of the two first-named officers, one shall be a citizen of the United States and the other shall be from a foreign country, represented in the Division of Exhibits.

5. The Chief of each Department shall have general charge of the organisation and direction of the Group Juries in his Department, for the purpose of securing the proper examinations of all exhibits, and to see that the work laid out for the juries is conducted strictly in accordance with the official rules and regulations.

He shall be admitted to all sessions of these juries for the purpose of directing their attention to matters relating to the judging of exhibits.

6. The work of the Group Juries shall begin September 1st, 1904, and shall be completed not later than twenty days thereafter.

Examinations or other work not completed in the time specified herein, will be transferred to the Department Jury.

7. Group Juries may, on the recommendation of the Chiefs of their respective Departments and with the approval of the Director of Exhibits, have authority to appoint, as associates or experts, one or more persons especially skilled in matters submitted for examination. These experts shall participate only

in such special work as they are selected to perform, and shall have no vote on the question of the merit of the exhibit under consideration.

8. Each Group Jury shall carefully examine all exhibits pertaining to the group to which it has been assigned. It shall also consider and pass upon the merits of the collaborators whose work may be conspicuous in the design, development or construction of the exhibits.

The jury shall prepare separate lists, presenting the names of such exhibitors as are out of competition; awards recommended to exhibitors in order of merit; awards recommended to collaborators in order of merit; a report giving an account of the most important objects exhibited and a general account of the group as a whole.

These papers shall be certified to the Chief of the Department to which the group belongs, and the Chief of the Department shall certify the same, with such recommendations as he may deem advisable, to the Department Jury.

9. In order to expedite their work, Group Juries may be divided into Committees for the examination of exhibits.

These Committees shall be governed by paragraphs one, two and three of Rule 8, just cited; when they have completed the work assigned them they shall report to the full jury, which shall review the findings after an inspection of all the exhibits in the group.

10. When the exigencies of the work require such procedure, and when recommended by a Chief of a Department and approved by the Director of Exhibits, two or more Group Juries may be combined.

11. In the case of temporary exhibitions and such other exhibits as are developed through a considerable period of time, or which for other reasons cannot be governed by the time limits prescribed, the juries of such groups may continue in service throughout the entire period of the Exposition. Special Juries may be formed when urgently needed for special occasions.

At the close of each temporary exhibit or competition, the jury having the same in charge shall prepare a list of awards proposed in order of merit and shall certify the same to the Chief of the Department to which the exhibit pertains.

Special awards for such temporary exhibits or competitions

may be provided by the Chief of the Department to which the exhibits belong, on the approval of the Director of Exhibits and the President of the Exposition Company.

12. Each Department Jury shall be composed of the Chairmen and Vice-Chairmen of the Group Juries of the respective Departments, with one member of the Directory of the Louisiana Purchase Exposition Company, to be named by the President of the Company, and one person appointed by the Board of Lady Managers.

The Department Juries shall choose their own officers, consisting of a Chairman, three Vice-Chairmen and a Secretary.

The Chairman and First Vice-Chairman shall be, one a citizen of the United States, and the other a citizen of a foreign country.

The Secretary may be selected by the members of the Jury from a list of persons recommended by the Director of Exhibits.

13. Each Department Jury shall complete its organisation and begin its work on September 20th, 1904.

The duties of these juries shall be to consider carefully and review the reports of the Group Juries; to harmonise any differences that may exist between the recommendations of the several Group Juries as to awards, and to adjust all awards recommended so that they will be consistent with the Rules and Regulations.

No more than ten days may be devoted to this work, and when the awards recommended by the Group Juries have been adjusted, the Department Juries shall, through the Chiefs of their respective Departments, submit their findings to the Director of Exhibits, who shall, within five days after the receipt thereof, certify the same to the Superior Jury, including such work as may have been left incomplete by the Department Jury.

14. The officers and members of the Superior Jury shall be as follows: President, the President of the Louisiana Purchase Exposition Company; First Vice-President, the Director of Exhibits; Second Vice-President, a citizen of the United States to be named by the Louisiana Purchase Exposition Commission. The members of the Jury shall further consist of the Commissioners-General of the nine foreign countries occupying with exhibits the largest amounts of space in the exhibit palaces; the Chairmen and First Vice-Chairmen of the Department Juries;

the Chiefs of the Exhibit Departments ; and one person appointed by the Board of Lady Managers.

Two additional Vice-Presidents, and such other officers as may be required shall be elected by the Superior Jury from the members herein provided for.

No Chief of a Department shall represent more than a single Department. The President of the Louisiana Purchase Exposition Company shall appoint, from the United States membership of the Department Juries, such other members as may be necessary to give to each Exhibit Department of the Exposition a representative on the Superior Jury.

There shall also be a Secretary of the Superior Jury, who may be selected by the members of the Jury from a list of persons recommended by the President of the Jury.

15. The Superior Jury shall determine finally and fully the awards to be made to exhibitors and collaborators in all cases that are formally presented for its consideration.

Formal notification of the awards shall, in each case, be sent by the President of the Jury to the exhibitors at the place of their respective exhibits.

If, for any reason, an award is not satisfactory to an exhibitor, he may file written notice to that effect with the President of the Jury within three days after the date of the official notification of the award ; and this notice shall be followed, within seven days after said date, by a written statement setting forth at length his views as to wherein the award is inconsistent or unjust.

In the adjustment of differences and in considering the recommendations of the Department Juries, the Superior Jury may provide for hearings of members of the Department Jury and of exhibitors, but in no case shall it be required to consider matters which have not been regularly presented as heretofore provided.

16. The work of the Superior Jury shall be completed on October 15th, 1904, and, as soon as practicable thereafter, formal public announcement of the awards shall be made. A final complete list of the awards shall be published by the Louisiana Purchase Exposition Company, in accordance with the provisions of Section 6 of the Act of Congress, and Section 6, Article XXII, of the Rules and Regulations.

17. A Committee, consisting of the President and the four

Vice-Presidents of the Superior Jury, shall continue the work of the Superior Jury as long as may be found necessary after that Jury has disbanded.

This Committee shall have charge of the preparation, collection and publication of the official list of awards and shall make the necessary provisions for the proper distribution of the awards.

18. The deliberations of all juries shall be strictly secret.

The President of the Exposition Company, the Director of Exhibits, and the Chiefs of Departments shall have the privilege of attending any sessions of the several juries.

A majority of any jury shall, in all cases, render and confirm a decision.

19. The exhibits of persons serving as jurors or alternates over groups embracing their exhibits, shall be classed as non-competitive and shall not be examined by the juries. This rule applies to managers, agents or others, representing a company or corporation which is entered as an exhibitor. It does not, however, apply to the officers or representatives of Governments which are entered as exhibitors.

20. Each regular exhibitor may receive an award, although his exhibit be joined with that of others in a single installation.

Only one award shall be given to a collective exhibit, but the names of all the contributors to such collective exhibit may be entered on the diploma awarded, and each participant shall receive a copy.

If so desired by a group of exhibitors, a single award may be made to an individual representing such group.

21. An exhibit shall receive only one award in any group.

The same object, shown in several groups and adjudged by more than one jury, shall be entitled only to the highest award accorded to it.

An exhibitor who has different objects entered as exhibits in different groups may be given an award in each group.

22. Exhibitors who desire to have their exhibits excluded from competition shall notify the Chief of Department as to their wishes when making application for space, giving their reasons at length for their request and objections to a competitive exhibit; and these papers shall be transmitted, through the Director of Exhibits, to the President of the Louisiana

Purchase Exposition Company, with such recommendations as may be deemed necessary. Exhibits thus exempted from competition shall not be examined by the juries, and shall not be entitled to official recognition in connection with the system of awards.

23. In addition to the awards prescribed for exhibitors, an award may also be made to the inventor, designer or artisan, who, as collaborator, has, in the judgment of the jury, shown more than ordinary skill in connection with an exhibit. A collaborator is a person who has distinguished himself as the designer or producer of remarkable objects shown at the Exposition. He is not a person who has merely aided in the arrangement or installation of exhibits.

In order that this may be equitably accomplished, each exhibitor who has received an award may furnish the Chief of his respective Department, for transmission to the proper jury, a list of the names of his collaborators, arranged in order of merit, based on skill, ability, magnitude and value of work, and length of service. It will then remain for the Jury of Awards to determine whether the assistance rendered by the persons named in the manner described has been sufficient to entitle them, or any of them, to the rank of collaborator, and to name the award which may be conferred therefor.

24. Whenever it is applicable, a decimal scale system shall be used in judging the merits of exhibits, 100 representing perfection; and as a suggestion to juries, for instance in commercial exhibits, the following is offered:

(a)—Value of the product, process, machine or device, as measured by its usefulness, its beneficent influence on mankind in its physical, mental, moral and educational aspects.

Counting not to exceed 25.

(b)—Skill and ingenuity displayed in the invention, construction and application.

Counting not to exceed 25.

(c)—Merits of the installation as to the ingenuity and taste displayed, the cost and value as an exposition attraction.

Counting not to exceed 10.

- (d)—Magnitude of the business represented, as measured by the gross sales during the calendar year preceding the opening of the Exposition.

Counting not to exceed 10.

- (e)—Quality or cheapness, with reference to the possession by the exhibit of the highest possible quality, or the fact that the article is sold at so low a price with reference to its quality as to make it a valuable acquisition to the purchaser.

Counting not to exceed 10.

- (f)—For completion of installation within required time, and for excellence of maintenance.

Counting not to exceed 10.

- (g)—Length of time the exhibitor has been in business, as showing whether exhibit is a development of original invention or is an improvement on the work of some prior inventor.

Counting not to exceed 5.

- (h)—Number and character of awards received from former expositions.

Counting not to exceed 5.

25. A special award consisting of a gold medal in each Department, may be recommended by the Department Jury, for the best, most complete and most attractive installation.

26. The following scale of markings shall be used in determining the final merits of an exhibit and fixing the award that should be made, 100 being used as indicating perfection :

Exhibits receiving markings ranging from 60 to 74 inclusive—Bronze Medal.

Exhibits receiving markings ranging from 75 to 84 inclusive—Silver Medal.

Exhibits receiving markings ranging from 85 to 94 inclusive—Gold Medal.

Exhibits receiving markings ranging from 95 to 100 inclusive—Grand Prize.

27. The diplomas or certificates of award for exhibitors shall be signed by the President of the Louisiana Purchase Exposition

Company, the President of the Louisiana Purchase Exposition Commission, the Secretary of the Louisiana Purchase Exposition Company, the Director of Exhibits and the Chief of the Department to which the exhibit pertains.

28. Special commemorative medals and diplomas may be issued to the officers of the Exposition, to United States, State and Foreign Commissioners, to the members of the International Jury of Awards, and to such other persons as may be deemed worthy of special recognition.

29. The compensation of foreign jurors shall be fixed and paid by the countries which they respectively represent.

30. United States Jurors, except such as are officers and employes of the Exposition, shall receive actual cost of necessary transportation, and compensation at the rate of seven dollars (\$7.00) per day for such time as they are actually engaged in the work assigned them at the Exposition.

EXTRACT FROM THE GENERAL REGULATIONS.

“The system of awards will be competitive. The merit of exhibits as determined by the Jury of Awards will be manifested by the issuance of diplomas, which will be divided into four (4) classes: a grand prize, a gold medal, a silver medal and a bronze medal. Each diploma will be accompanied by a commemorative bronze medal bearing the official design of the Exposition.”

SYNOPSIS OF THE GENERAL CLASSIFICATION OF EXHIBITS.

DEPARTMENT A.—EDUCATION.

- Group 1. Elementary Education.
 „ 2. Secondary Education.
 „ 3. Higher Education.
 „ 4. Special Education in Fine Arts.
 „ 5. Special Education in Agriculture.
 „ 6. Special Education in Commerce and Industry.
 „ 7. Education of Defectives.
 „ 8. Special Forms of Education. Text Books. School
 Furniture and School Appliances.

DEPARTMENT B.—ART.

- Group 9. Paintings and Drawings.
 „ 10. Engravings and Lithographs.
 „ 11. Sculpture.
 „ 12. Architecture.
 „ 13. Loan Collection.
 „ 14. Original Objects of Art Workmanship.

DEPARTMENT C.—LIBERAL ARTS.

- Group 15. Typography. Various Printing Processes.
 „ 16. Photography.
 „ 17. Books and Publications. Bookbinding.
 „ 18. Maps and Apparatus for Geography, Cosmography, and
 Topography.
 „ 19. Instruments of Precision, Philosophical Apparatus, etc.
 Coins and Medals.
 „ 20. Medicine and Surgery.
 „ 21. Musical Instruments.
 „ 22. Theatrical Appliances and Equipment.
 „ 23. Chemical and Pharmaceutical Arts.
 „ 24. Manufacture of Paper.
 „ 25. Civil and Military Engineering.
 „ 26. Models, Plans, and Designs for Public Works.
 „ 27. Architectural Engineering.

DEPARTMENT D.—MANUFACTURES.

- Group 28. Stationery.
- „ 29. Cutlery.
 - „ 30. Silversmiths' and Goldsmiths' Ware.
 - „ 31. Jewellery.
 - „ 32. Clock and Watch Making.
 - „ 33. Productions in Marble, Bronze, Cast Iron, and Wrought Iron.
 - „ 34. Brushes, Fine Leather Articles, Fancy Articles, and Basket Work.
 - „ 35. Articles for Travelling and for Camping. India Rubber and Gutta Percha Industries.
 - „ 36. Toys.
 - „ 37. Decoration and Fixed Furniture of Buildings and Dwellings.
 - „ 38. Office and Household Furniture.
 - „ 39. Stained Glass.
 - „ 40. Mortuary Monuments and Undertakers' Furnishings.
 - „ 41. Hardware.
 - „ 42. Paper Hanging.
 - „ 43. Carpets, Tapestries, and Fabrics for Upholstery.
 - „ 44. Upholsterers' Decorations.
 - „ 45. Ceramics.
 - „ 46. Plumbing and Sanitary Materials.
 - „ 47. Glass and Crystal.
 - „ 48. Apparatus and Processes for Heating and Ventilation.
 - „ 49. Apparatus and Methods (not Electrical) for Lighting.
 - „ 50. Textiles.
 - „ 51. Equipment and Processes used in the Manufacture of Textile Fabrics.
 - „ 52. Equipment and Processes used in Bleaching, Dyeing Printing, and Finishing Textiles in their various Stages.
 - „ 53. Equipment and Processes used in Sewing and Making Wearing Apparel.
 - „ 54. Threads and Fabrics of Cotton.
 - „ 55. Threads and Fabrics of Flax, Hemp, etc. Cordage.
 - „ 56. Yarns and Fabrics of Wool.
 - „ 57. Silk and Fabrics of Silk.
 - „ 58. Laces and Embroideries and Trimmings.
 - „ 59. Industries producing Wearing Apparel for Men, Women, and Children.
 - „ 60. Leather, Boots and Shoes, Furs and Skins. Fur Clothing
 - „ 61. Various Industries connected with Clothing.

DEPARTMENT E.—MACHINERY.

- Group 62. Steam Engines.
- „ 63. Various Motors.
- „ 64. General Machinery.
- „ 65. Machine Tools.
- „ 66. Arsenal Tools.

DEPARTMENT F.—ELECTRICITY.

- Group 67. Machines for Generating and Using Electricity.
- „ 68. Electro-Chemistry.
- „ 69. Electric Lighting.
- „ 70. Telegraphy and Telephony.
- „ 71. Various Applications of Electricity.

DEPARTMENT G.—TRANSPORTATION.

- Group 72. Carriages and Wheelwrights' Work. Automobiles and Cycles.
- „ 73. Saddlery and Harness.
- „ 74. Railways : Yards, Stations, Freight Houses, Terminal Facilities of all Kinds.
- „ 75. Material and Equipment used in the Mercantile Marine.
- „ 76. Material and Equipment of Naval Services. Naval Warfare.
- „ 77. Aerial Navigation.

DEPARTMENT H.—AGRICULTURE.

- Group 78. Farm Equipment and the Methods of Improving Lands.
- „ 79. Agricultural Implements and Farm Machinery.
- „ 80. Fertilisers.
- „ 81. Tobacco.
- „ 82. Appliances and Methods used in Agricultural Industries.
- „ 83. Theory of Agriculture. Agricultural Statistics.
- „ 84. Vegetable Food Products. Agricultural Seeds.
- „ 85. Animal Food Products.
- „ 86. Equipment and Methods Employed in the Preparation of Foods.
- „ 87. Farinaceous Products and their Derivatives.
- „ 88. Bread and Pastry.
- „ 89. Preserved Meat, Fish, Vegetables and Fruit.
- „ 90. Sugar and Confectionery. Condiments and Relishes.
- „ 91. Waters.
- „ 92. Wines and Brandies.

- Group 93. Syrups and Liqueurs. Distilled Spirits. Commercial Alcohol.
- „ 94. Fermented Beverages.
 - „ 95. Inedible Agricultural Products.
 - „ 96. Insects and their Products. Plant Diseases.
 - „ 97. Horses and Mules.
 - „ 98. Cattle.
 - „ 99. Sheep.
 - „ 100. Goats, etc.
 - „ 101. Swine.
 - „ 102. Dogs.
 - „ 103. Cats, Ferrets, etc.
 - „ 104. Poultry and Birds.

DEPARTMENT J.—HORTICULTURE.

- Group 105. Appliances and Methods of Pomology, Viticulture, Floriculture, and Arboriculture.
- „ 106. Appliances and Methods of Viticulture.
 - „ 107. Pomology.
 - „ 108. Trees, Shrubs, Ornamental Plants and Flowers.
 - „ 109. Plants of the Conservatory.
 - „ 110. Seeds and Plants for Gardens and Nurseries.
 - „ 111. Arboriculture and Fruit Culture.

DEPARTMENT K.—FORESTRY.

- Group 112. Appliances and Processes used in Forestry.
- „ 113. Products of the Cultivation of Forests and of Forest Industries.
 - „ 114. Appliances for Gathering Wild Crops and Products Obtained.

DEPARTMENT L.—MINES AND METALLURGY.

- Group 115. Working of Mines, Ore Beds and Stone Quarries.
- „ 116. Ores and Minerals.
 - „ 117. Mine Models, Maps, Photographs.
 - „ 118. Metallurgy.
 - „ 119. Literature of Mining, Metallurgy, etc.

DEPARTMENT M.—FISH AND GAME.

- Group 120. Hunting Equipment.
- „ 121. Products of Hunting.
 - „ 122. Fishing Equipment and Products.
 - „ 123. Products of Fisheries.
 - „ 124. Fish Culture.

DEPARTMENT N.—ANTHROPOLOGY.

- Group 125. Literature.
,, 126. Somatology.
,, 127. Ethnology.
,, 128. Ethnography.

DEPARTMENT O.—SOCIAL ECONOMY.

- Group 129. Study and Investigation of Social and Economic Conditions.
,, 130. Economic Resources and Organisation.
,, 131. State Regulation of Industry and Labour.
,, 132. Organisation of Industrial Workers.
,, 133. Methods of Industrial Remuneration.
,, 134. Co-operative Institutions.
,, 135. Provident Institutions.
,, 136. Housing of the Working Classes.
,, 137. The Liquor Question.
,, 138. General Betterment Movements.
,, 139. Charities and Correction.
,, 140. Public Health.
,, 141. Municipal Improvement.

DEPARTMENT P.—PHYSICAL CULTURE.

- Group 142. Training of the Child and Adult. Theory and Practice.
,, 143. Games and Sports for Children and Adults.
,, 144. Equipment for Games and Sports.
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REPORT BY CYRIL DAVENPORT, Esq.,

BRITISH JUROR FOR TYPOGRAPHY.

The jurors in this group were divided into two Committees, the first examining and recommending awards for the machines themselves, printing presses of all sorts, typewriters, lithographic stones and any other inventions for the purpose of reproducing pictures or printed matter which was exhibited.

The second Committee examined the results only of these various machines and printing processes, and my work was with this Committee.

The great mass of work shown was of a trade character only, but in the exhibit of Great Britain we practically examined an art exhibit which I will particularise later.

Typography was nominally to be judged by Group 15, but actually we found no typographical exhibit for our inspection. To some extent typography was considered in Group 17, but only as one of the elements in the entire production of a printed book. Between these two groups typography fell, and in neither of them was there any proper consideration of this most important subject, nor in either of them was it possible to give any award for typography as a special subject, or even to get for it any due consideration.

The exhibits shown in Group 17, were, however, sufficient to show that if they had been submitted to the judgment of Group 15, so far as typography was concerned, the palm would probably have been awarded to (1) Great Britain, (2) Germany, (3) France.

The majority of exhibits were some form or other of lithography, and for pictorial advertising purposes there seems little doubt that this is the cheapest and most effective form possible. Much of this class of work both in monotone and colour, but as a rule of small importance, was shown by Argentine Republic, Belgium, Brazil, Cuba, Denmark, Germany, Mexico, Portugal and Switzerland.

BRITISH SECTION.

The British exhibit was of a different character to any other in Group 15, because it contained etchings, mezzotints and line engravings (examples of which were also shown in Groups 9 and 10); there were also several photogravures (of which other examples were shown in Group 16), the excellent inking and printing of which was remarkable, and so was the printing in colour. Many of the plates were large. The quality of the mezzotinting was now and then somewhat weak, and appeared as if it were done hurriedly, but this fault was by no means invariable. In this section collaborators were deservedly recognised, and I should have welcomed some claims for recognition for some of the very able printers of many of the fine impressions. The jury were not allowed to suggest awards for collaborators unless they were claimed for them by the exhibitors. It is gratifying to note that every British exhibitor obtained an award in this group. The large screens on which the fine British prints were arranged, were in every way excellent for the purpose—the jury could see each exhibit as a whole at a glance and also easily note any detail. Although classed in Group 15, the exhibit of Great Britain was to all intents and purposes an art exhibit, and I do not see why the extremely fine show of beautiful wood engravings by American artists was not classed here also, as a print from a wood block is clearly a “print.” We had as a matter of fact to judge prints from wood blocks in the Japanese exhibit, they were colour prints, some of them extremely fine—and also some large life-size portraits engraved on wood—very strong and brilliant, in the German Section.

In comparing the awards given to this fine British section with those received by many of the foreign exhibitors of chromo-lithographic advertisements, it was impossible not to realise that at the hands of an international jury a good exhibit of a low class art was very likely to receive as high a commendation as a good exhibit of a high class art. So that there is always a premium upon the lower class exhibit. There is no doubt if anything like a fair comparison could have held with other awards in the same class that each of the five British firms exhibiting deserved the highest award.

AMERICAN SECTION.

The United States showed several important and very successful exhibits of chromo-lithographs as used for advertisements, and also several novel forms of advertisements, such as relief prints and many other ingenious contrivances—rapid changes and transparencies. Lithographs were shown also in Groups 9 and 10, and so were wood engravings, some of which came under the consideration of Group 15 in the exhibits of Germany and Japan, other wood engravings were also to be found classed in the art section. In fact there was considerable overlapping of subjects in several instances, and in consequence of this some of the exhibits missed their proper and comparative importance.

FOREIGN SECTIONS.

France.

France showed lithography in monotone and colour, and black and coloured typography, all very good, and also an important exhibit of excellent photogravures. In the French Pavilion was a large exhibit of fine line engravings, "Chalco-graphy of the Louvre," after ancient as well as modern artists.

Germany.

Germany showed a very large and fine collection of placards, photo-coloured printings and stereotypes, several etchings and fine heliogravures and lithographs in monotone and colour. Some remarkable woodcuts of large size were shown in this section, life-size portraits cut with great skill and most effective. Many books also were illustrated with wood engravings of much value, but of no artistic interest, many of them being engravings of tools and apparatus of various kinds engraved almost entirely by mechanical means.

CYRIL DAVENPORT.

REPORT BY J. CRAIG ANNAN, Esq.,

BRITISH JUROR FOR PHOTOGRAPHY.

Twenty-four countries in all contributed the exhibits to this group, and eight of these might be classed as important collections illustrative of the highest standard of photographic art.

The exhibits may be divided into three classes, commercial, pictorial and scientific. The two latter greatly predominated in bulk and interest, and, in some instances, including that of Great Britain, constituted the whole collection. It was therefore impossible to form any conclusive opinion with regard to the position which this country holds towards foreign competitors, in the photographic industry.

The photo-mechanical process of typographic block-making, for instance, may now be considered a British industry of some importance. It provides employment for thousands of highly skilled workmen, who command good salaries, yet it was unrepresented in our exhibit.

Photo-mechanical reproductive work together with photographic apparatus and material are practically the only classes of photographic produce suitable for international commerce, and consequently, this department must be considered a most important one, but Germany alone took the opportunity to show an elaborate exhibit of such work. It exhibited numerous specimens of every kind of photogravure, collotype and typographic process, both in monotone and colour, and these were contributed by a number of different establishments.

Considering the exhibits as a whole it was commonly agreed by the Jury that Great Britain had sent the finest and most comprehensive collection. It was not only very extensive but had been most carefully selected and contained very few specimens which were not considered worthy of award.

A strong art movement has been taking place in connection with photography during the last decade, and its effect was very apparent in the pictorial work shown by British, German and American photographers. Only about fifty per cent. of the exhibits were the work of professional photographers, and all

owed their origin to art enthusiasm rather than to commercial enterprise, and it is of importance to note that this effort to instil artistic qualities into photographic productions, and to have photography recognised as a vehicle for the expression of artistic feeling, has already had a marked tendency to improve the artistic character of commercial work in the countries named. It is satisfactory to note that from this point of view the pictorial work from Great Britain occupied the foremost place, while the technical quality was also of a very high order. The pictures numbered 224, and were contributed by 59 exhibitors. The subjects included portraits, landscapes, architecture and genre, and all were treated from the point of view of combining artistic sentiment with the natural realism of the ordinary photograph.

The United States exhibit was of less uniform quality than the British collection, but contained many pictures of great interest and of high artistic merit; it suffered considerably from the absence of exhibits by members of the Photo. Secession Society, who considered that some space ought to have been found in the Art Palace for at least a selection of the artistic photographs, and declined to contribute their work in consequence. The exhibits of these two countries were chiefly composed of prints by the carbon and platinotype processes. These methods both produce permanent pictures, and are eminently suitable for commercial work of high quality.

Germany also had a fine exhibit, but in many of the pictures there appeared to be a striving after extravagant and eccentric effects. These were frequently obtained by the use of the gum-bichromate method of printing. This process is not purely photographic, but depends largely on the skill in draughtsmanship of the operator, and consequently the special qualities which belong to a photograph cannot be relied upon when the prints are produced in this manner.

France had a charming little collection of artistic work from the Photo Club de Paris, but the exhibits of the professional photographers, while very fine in technique, showed no advance on the work which they might have exhibited twenty years ago. The portraits shown were chiefly printed in processes founded on a silver basis which produce prints of great softness and full detail, but which are all more or less uncertain as to permanency. The exhibit also included a considerable variety

of work produced by photo-mechanical processes, and these, while limited in quantity, were generally of high technical quality. A collection of reproductions of paintings by the carbon process was also an attractive feature.

Austria, which possesses a number of eminent pictorial photographers, did not exhibit in this group, and none of the collections shown by other countries in this class require special remark.

In Scientific Photography Great Britain contributed a very comprehensive series of photographs illustrating the numerous adaptations of photography to the various sciences. Thirty-seven institutions or individuals contributed 250 frames, and these included specimens of work in the fields of Astronomy, Botany, Geology, Metallurgy, Microscopy, Geography, History and Three-Colour Photography. In almost all cases these exhibits were not only of great scientific value, but of exceedingly fine technical workmanship. In many cases very ingenious and delicate apparatus must have been designed for their production, and the Jury awarded the numerous prizes in this class with enthusiasm.

The collection of history photographs taken and exhibited by Sir J. Benjamin Stone, M.P., was a unique and most important exhibit. It consisted of a series of 300 photographs, illustrative of Festivals, Ceremonies and Old Customs observed in Great Britain, together with notable incidents, such as the visits of foreign potentates to our country. These were not only very interesting in themselves, but demonstrated in a most convincing manner the utility of Photography as a recorder of contemporaneous history.

The only important American Scientific work which came before the Jury was that of the astronomical photographs exhibited by the national observatories, and this was worthy of the highest possible praise. This exhibit was not entered for competition in Group 16, but was observed by the Jury and awarded a Grand Prize. It is possible, indeed it is certain, that much excellent photographic work connected with various scientific and industrial exhibits must have been displayed in various departments, but, with this exception, the Jury only took cognisance of that which was entered in the Group Catalogue.

The German scientific work submitted was confined to surgical and anatomical photographs, but was of exceedingly

fine quality and of great value. It consisted chiefly of a large and important exhibit of Rontgen work of remarkable excellence, and of instruments for photographing the background of the eye and such interior portions of the human body as could be reached by a long tube of $\frac{1}{4}$ inch diameter. In the German East Africa Section there was exhibited an extensive and extremely interesting series of anthropological photographs illustrative of the various native tribes who inhabit that Province.

The contribution by France to scientific work consisted chiefly of a display of apparatus for use in the various photographic processes. It was a very complete and interesting exhibit, but contained nothing of outstanding merit.

In the Italian Section two firms contributed a very excellent series of reproductions of paintings and sculpture printed by the carbon process.

Many of the exhibits of the other countries were of very limited extent and contained nothing worthy of special record.

J. CRAIG ANNAN.

REPORT BY MAJOR-GENERAL JAMES WATERHOUSE,
BRITISH JUROR FOR PHOTOGRAPHY.

I have the honour to submit the following reports of my work as Juror in Groups 16 (Photography), 18 (Geography) and 19 (Instruments of Precision).

As I was Vice-Chairman of the Jury in Group 18, I considered that my principal Jury, and devoted myself more particularly to it, there being only three other members—all Americans—and my presence with them was, therefore, more necessary than it was with the larger Juries in Groups 16 and 19. I gave what time I could to the latter; but my duty with them was principally confined to looking after the interests of the British Exhibitors, and I attended the meetings of these Juries when the British Exhibits were under discussion. In Group 16, Mr. Craig Annan was, I believe, present almost throughout the discussions, and he has reported fully on the group. In Group 19, I was the only British representative, and, though I was not able to accompany the Jury on their tours of inspection of the exhibits with the exception of the British and German, I examined some of the more important exhibits afterwards. I have, however, very little practical knowledge of instruments, and am, therefore, quite unable to make any full report on them, and, indeed, it would require several specialists to do so.

The conditions of the St. Louis Exhibition were in many ways exceptional owing to the vast scale on which it was organised, the immense size of the principal buildings, the great distances to be covered in going from one end of the grounds to the other, and the want of convenient means of communication between distant buildings, which was very much felt by members of the different Juries whose duties took them into all parts of the Exhibition. On this account the work was much more fatiguing, and took longer than it need have done. It would have been a great convenience if conveyances had been at the disposal of the Juries to take them to distant parts of the grounds, and I throw out the suggestion for considera-

tion in the event of any similar Exhibition being got up in future.

I think also that some suitable accommodation might have been provided for the Jurors to meet together, or write their notes and reports in reasonable comfort. A central meeting-place for the Jurors would have been a very great convenience. In the Palace of Liberal Arts, to which I was attached, there was a room set apart for the Jurors' meetings, used also as a lecture room. There was very little table accommodation and no provision for writing. It had few windows, and was quite dark, unless lit up. The only other accommodation was the small office in the British Section.

If it were in any way feasible it would be a great advantage to Jurors to have Group Catalogues comprising all the exhibits in the Group, as, in fact, was done with the catalogues of the British Section. Each Juror would then know exactly what he had to look at and where to find it, with information regarding the exhibits. Such catalogues would also, no doubt, be found very convenient by visitors specially interested in any particular group.

Another point to which I should like to draw the attention of the Royal Commission is the advisability of all Government Exhibits being considered *Hors Concours*, because it seems to be very undesirable that Governments should enter even by implication into competition with the trade for Awards. As a Juror one felt bound to get the highest possible awards for a Government exhibit, but it was not always pleasant, and I think it lowered the dignity of the country to a certain extent. In most cases on the three Juries in which I was concerned, the awards to British Exhibitors were made most freely, and there was always a cordial desire to do honour to our official exhibits; I think, however, it would be better that such exhibits should not enter into the general competition, but receive special complimentary awards. The officers concerned would thus receive the due recognition of their work which they naturally expect and value highly. They would feel also that these awards were on a higher plane than the ordinary.

It gives me great pleasure to acknowledge the friendly courtesy I met with from my foreign colleagues on this and the other two Juries, and to note their readiness to give the best possible credit to the British Exhibits, as may be judged from the large proportion of Awards to Exhibitors.

In conclusion I desire to very warmly acknowledge the kind and cordial assistance I received from the Commissioner-General and all the members of his staff, as well as from Colonel J. A. Ockerson, the Chief of the Liberal Arts Department, his staff and other Exhibition Officials, particularly Professor A. H. Thompson, who was in charge of the U.S. Geological Survey Exhibits and other officers of that Survey and the Coast and Geodetic Survey, who very kindly gave me every assistance in examining the exhibits in their charge as noted in my report on Group 18.

BRITISH SECTION.

The British exhibits consisted mainly of (1) a collection of specimens of Pictorial Photography selected by a committee in London, and arranged by Mr. A. Horsley Hinton; (2) a collection of photographs illustrating Scientific Photography, made by the Royal Photographic Society, including a large and interesting series of Geological photographs exhibited by the Geological Photographs Committee of the British Association; (3) an extensive collection of History photographs exhibited by Sir J. Benjamin Stone, M.P., illustrating his work for the National Record Association, the object of which is to preserve a permanent pictorial record of current national life and history, and selected for the purpose of illustrating the educational value of such pictures; (4) other scientific photographs exhibited by public institutions and private individuals, and not included in the Royal Photographic Society's series.

These exhibits of Pictorial, Scientific and Historical photographs were very highly appreciated by the Jury. The series of Scientific photographs, which gained the award of a Grand Prize for the Royal Photographic Society, was the only general collection of the kind, though there were many exhibits of the scientific applications of photography scattered throughout the Exhibition, but particularly in the German and United States Sections of the Palace of Education and other buildings. The British collection included, however, many special subjects not to be found elsewhere.

Five Grand Prizes, eighteen Gold, six Silver and six Bronze Medals were awarded for the Scientific and Historical photographs from forty exhibitors, while three Grand Prizes, eleven Gold, fourteen Silver and fourteen Bronze Medals were awarded for Pictorial photographs from fifty-nine exhibitors.

These exhibits were all well arranged in the Palace of Liberal Arts, but, with the exception of Sir Benjamin Stone's collection, they were at a great disadvantage as regards lighting, especially the Scientific photographs. It is to be regretted too, that the fine astronomical transparencies from the Royal Observatory, Greenwich, and the very beautiful transparencies and lantern slides of photo-micrographs, &c., in the Royal Photographic Society's collection were not displayed so that they could be seen by transmitted light, in the same way as was done for the American, French and other foreign exhibits of the same kind. As it was, the lantern slides were entirely lost by being shown in a flat glass show-case. Had I not known their value and brought them to the notice of the Jury, they would probably have been overlooked. In the German Educational Section arrangements were made for public displays of the lantern slides illustrating various scientific subjects, and similar shows of the beautiful series of slides photographed in colours by Dr. Norman, illustrating the bacilli of various diseases; those by Mr. Bentley illustrating the biology and fertilisation of flowers, as well as the large collection of 200 educational slides sent out by Messrs. Newton and Co., would, I am sure, have been a very great attraction to many of the visitors, and greatly redounded to the national credit in this direction.

The large British industries connected with the manufacture of photographic apparatus, dry plates, papers, &c., were quite unrepresented.

AMERICAN SECTION.

There was a very large show of photographs by American photographers in the Liberal Arts building. They also laboured under the disadvantage of being badly lighted, for the most part being ranged on a wall below the windows. Many of them were by amateurs of genre and other subjects, and professional portraiture. Mary A. Booth exhibited photo-micrographs and enlarged images of microscopical objects; and this was the only scientific exhibit in the collection. The commercial exhibits were few in number, the principal one being from the Cramer Dry Plate Company of St. Louis, who had a tasteful pavilion decorated with photographs and enlargements, and transparencies made on their plates, also samples of the plates themselves. Messrs. A. W. Elson showed carbon photographs and photogravures. W. C. South exhibited "Solgram" photo-

graphs printed in colours from ordinary orthochromatic plates. Messrs. C. P. Goerz, of New York, had an installation for showing the operation of lens-polishing and grinding, also specimens of their photographic lenses, cameras, prism-binoculars, etc. A. W. Fox showed focussing and photo-arc lamps.

So far as I could judge there was nothing very special about these exhibits, but many of the photographs were very good work.

FOREIGN SECTIONS.

Germany.

The most important and interesting exhibits of German photography were the Scientific photographs in the German Section of the Educational building, which included an interesting series of Archæological photographs of the excavations of the Roman Citadel of Saalburg, near Homburg, and of the ruins of Baalbek, Miletus and Priene, together with an extensive series of enlarged photographs of Architectural monuments from West Germany, all of these being taken by the Kgl. Messbildanstalt in Berlin, and forming a valuable aid for art instruction in German Universities. There were also a large number of photographs illustrating University, Hospital, Observatory and other public buildings and institutions. In the Section of Medicine, several of the principal infectious diseases were illustrated by micro-photographic enlargements of the different organisms producing the infections. In the Section of Surgery, some fine pathological and clinical photographs and lantern slides of Röntgen-Ray photographs illustrating the various phases of diseases.

A marked feature of this German Educational exhibit was the projection of photographs in natural colours, by Professor Miethe's process, shown in the lecture hall once or twice in the week, as well as demonstrations of lantern slides.

The walls of the rooms containing the Scientific Instruments were decorated with some of the enlarged photographs by the Kgl. Messbildanstalt, already noticed, including views of the interior and exterior of the Royal Observatory at Potsdam and of the Reichsanstalt at Charlottenburg, also photographs of some of the more important instruments in use in them and other scientific institutions in Karlsruhe and Munich.

On a revolving stand were exhibited 64 photographs of instruments in use at the Aeronautical Observatory of the Royal

Meteorological Institute at Potsdam, the Royal Astrophysical Observatory and the Royal Meteorological and Magnetic Observatory at Potsdam; the Royal Geophysical Institute and Royal Observatory at Göttingen; the Imperial Normal-Standards Commission and the Physico-technical Reichsanstalt at Charlottenburg.

Dr. M. Wolf, the well-known astronomer and professor in the University of Heidelberg, exhibited prints and lantern slides of photographs of the heavens, the latter being shown from time to time with the Zeiss epidiascope in the lecture room.

The purely Educational work, again, was largely illustrated by photographs of the school buildings, class-rooms, etc., and of the school work. Full details of most of these interesting exhibits are given in the catalogue of Scientific Instruments and other Educational catalogues prepared by the German authorities.

In Pictorial Photography Germany also had a very good display in the Liberal Arts building, both of landscapes and portraiture, the latter perhaps prevailing, and of a very high quality, the large heads being distinguished by force, relief, good modelling and chiaroscuro.

There were no exhibits of photographic apparatus, plates and materials, except C. P. Goerz's focus-projection apparatus for coloured photographs by Professor Dr. Miethe's process which properly belongs to Group 19, as also does Zeiss' Epidiascope, another projection apparatus, used in the lecture hall.

The Jupiter Electrophotographische Gesellschaft of Frankfurt, a.M., exhibited an apparatus for instantaneous photography. Some photogravures and other process work—white and black and three-colour—were also exhibited in this group, but presented no special features of interest beyond general excellence.

The German pictorial photographic exhibits generally were well lighted and arranged.

France.

The photographic exhibits from France were more practically representative of the art and industry than those of any other country. Pictorial and professional photography were well represented by the collective exhibits of the Photo Club de Paris, La Revue de Photographie, La Chambre Syndicale de la Photographie et de ses applications and l'Association Co-operative "La Photographie." These collections, which included many charming artistic photographs, were not very well lighted

or arranged. There were a few other exhibits of professional and amateur photography.

The literature of photography was represented by M. Charles Mendel of Paris, the well-known publisher.

Photographic engravings were shown by Messrs. Balagny, Paul de Bary, P. J. Dujardin, Prieur and Dubois, while Messrs. Braun and Co. showed a fine collection of carbon photographs.

Scientific photography was not well represented, there being only one exhibitor of Radiographic specimens and medical photographs.

There were several exhibits of apparatus from the well-known houses of Bellieni, of Nancy; Clement and Gilmer, Demaria Frères, L. Gaumont and Co., Jarret, Jules Richard (Grand Prize), L. Turillon of Paris.

The display of photographic material, plates, paper and chemicals, was also fairly extensive, the exhibit of Messrs. A. and L. Lumière and Sons, of Lyons, taking the lead, though no award could be made to it because M. Lumière was one of the Jurors. It was shown in a handsome pavilion, in which were very tastefully arranged samples of the well-known plates and papers manufactured by the firm, together with negatives, transparencies and paper prints made upon them. Also specimens of the many new photographic chemical products which have been brought out by the firm during several years past. Cinematographic films and three-colour transparencies, etc.

Similar exhibits on a smaller scale were made by Messrs. R. Guilleminot, Boespflug and Co., Soc. Anon. J. Jouglé and Rueil and Co., of Paris.

In this group, as in others, the general character of the French exhibits was distinctly commercial rather than educational.

Italy.

There were only five exhibitors in this Group from Italy. Messrs. Alinari Brothers, the well-known photographic publishers of Florence, had a very fine selection of views and art reproductions. Other exhibitors were Messrs. G. Brogi of Florence—photographs and pictures of Italy; G. Marchi—photography and its applications; A. Trombetta and Sons of Campobasso—photographs; Messrs. Murer and Duroni—express Murer cameras.

Austria.

The Austrian Government exhibit included two collections of artistic photographs contributed by the Imperial Royal Ministry of Railways and the Kuenstlerbund "Hagen," both of Vienna, shown in the Austrian Government Pavilion, while the sole commercial exhibit of photographs by Otto Wollner, of Vienna, was installed in the Palace of Manufactures.

Belgium.

The Belgian exhibits, like the French, were more of a commercial character, but there were only three exhibitors: Ch. Belot of Brussels—apparatus and prints, art and colour photography, enlarged and micrographic photography, &c.; Dr. Lanier Van Monckhoven, of Ghent, the well-known makers of photographic plates and papers, photographs and photographic material; and J. Malvaux of Brussels—specimens of three and four-colour engravings. These were installed in the Belgian National Pavilion.

Portugal.

From Portugal there were seven exhibits of photographs installed in the Palace of Manufactures, three from Lisbon, two from Pavia do Varzin, and two from Porto.

Mexico.

Mexican photography was very largely represented by thirty-six exhibitors, chiefly of portraits and views of places and scenery. There were no commercial or scientific exhibits.

Brazil.

In the same way, Brazil was represented by eighty-seven exhibitors of photographs, and no commercial or scientific exhibits.

Argentine.

In the Argentine, on the other hand, there were only seven exhibitors. The Amateur Photographic Society of Buenos Ayres sent a collection of photographs and stereoscopic slides; Messrs. Lepage & Co., biograph films and lantern slides; E. Moody and H. D. Olds, both of Buenos Ayres, photographic panoramas. The Argentine Department of Agriculture showed photographs of the live stock for which the country is famous. The Department of Lands and Colonies had some Albums of Views, and the muni-

cipality of Buenos Ayres some photographic enlargements of interesting views of the City.

Japan.

Among the eastern nations Japan stands prominent, and has long been famed for its beautiful and artistically-tinted photographic views of the country, of which a large number were exhibited. There were only ten exhibitors of photographs, one exhibitor of cameras, one of photo-mechanical prints, and the Photograph Postal Card Co., of Yokohama, exhibited a collection of postal cards.

China.

The Chinese have always taken considerable interest in photography, and shown a good deal of skill in working it. There were, however, only three exhibitors, F. W. Carey, of Canton, who sent photographs of the Yunnan Shan States and S.W. China; Lieut. L. Collos, of Chungking, photographs of the Upper Yangtse; the Hupeh Provincial Exhibit of photographs.

GENERAL REMARKS.

Besides these and a few other exhibits entered in Group 16 an immense number of views and miscellaneous photographs of all kinds was scattered through the different buildings throughout the Exhibition.

I had no opportunity of examining any of the commercial exhibits, and can make no comparison as to their merit relative to English goods of the same kind, nor can I say anything as regards commercial competition between British and foreign products. It seems to me doubtful whether from such Exhibitions any really valid comparison of the kind can ever be drawn. At any rate it could only be done by men thoroughly versed in the business and of wide commercial experience.

There was, so far as I could see, nothing particularly remarkable about the photographic exhibits, especially as regards new processes or new applications, but as I could not go round with the Jury, I may have missed seeing many interesting exhibits. They well exemplified, however, the most recent progress in the uses of photography as an aid to scientific investigation, and for artistic, educational and industrial requirements, and its increasing importance in all these directions.

J. WATERHOUSE,

Maj.-Gen., Indian Army.

REPORT BY CYRIL DAVENPORT, Esq.,

BRITISH JUROR FOR PUBLICATIONS.

The majority of the exhibits in this group were small and unimportant. Such were shown by Austria, Belgium, Ceylon, China, Cuba, Guatemala, Hungary, Italy, Nicaragua, Porto Rico, Portugal, and Siam.

Besides these there were the exhibits of the Argentine Republic, large, but chiefly consisting of newspapers and maps calling for no comment; Brazil, a large exhibit, mainly newspapers and small books; and Mexico, a large exhibit composed of small but unimportant books and newspapers.

To compensate for the want of fine work in all these numerous exhibits, there were from Japan a small exhibit, but noteworthy because of the fine illustrations in colour printed from engraved wooden blocks, very large and important exhibits shown by France, Germany and Great Britain, and a fair exhibit by the United States.

The large French exhibit was notable for the many very fine bindings shown; it was, however, excellent in many other ways, the paper, artistic printing, both in black and colour, types and illustrations, were always good, and in many instances particularly so. Several of the best known modern binders contributed, the designs as well as the workmanship being of the very highest order of excellence, and the general result most dainty and pleasing.

The German exhibit was large and remarkable for the multiplicity and excellence of the types used and the typography generally, the paper seemed good and the illustrated books numerous and well produced, many of them illustrated with engraved wood blocks.

The ornamentation of many of the German bindings showed great technical skill, but the generality of the designs were heavy in character. Many of the inlaid bindings, of which there were a considerable number, were like decorative pictures carried out in coloured leathers, and were not true binding designs.

To the blind-tooled and cut leather work, done after the ancient fashion, this criticism does not apply. German bookbinders, from the fifteenth century onwards, have been pre-eminent in this class of decorative book-binding, and the particular inspiration and technical skill necessary for its highest development, seem to be still existent among modern German bookbinders. They are also notoriously successful in the metal embellishments of such books, clasps, bosses and centre pieces all being excellent.

The German exhibit, as a whole, was admirably set out and shown. I believe it was done by some company that makes a speciality of such work. Besides this the Jury found no section so well *served* as the German. The attendants knew exactly where everything was, and were thoroughly well drilled and understood their own exhibit. The arrangements altogether were very good and the Jury were impressed by the manner in which their questions were answered by the staff on the spot, and the way in which particular examples were brought up as quickly as wanted. Arrangement of this kind is no small thing, and in many instances awards have been materially affected by the inability to find certain exhibits, and the departmental ignorance of the officials in charge.

The exhibit of Great Britain was of considerable extent, and all the exhibits were of a high excellence. The examples were carefully chosen, and, although well arranged from the artistic point of view, they were not always so from the jurors' standpoint, inasmuch as the exhibits of several of the firms, although classed together in the catalogue, were actually scattered in different showcases and troublesome to find. I believe, however, that there was some official reason concerning space for this difficulty, but international juries are apt to be inconsiderate and to get impatient, and disposed to vote small marks on even a small provocation such as this.

We found much suspicious appearance in the paper generally, more particularly with regard to the papers used in illustrated books with prints from half tone blocks, either in monotone or in colour. These blocks are now made with so fine a grain that it will not show properly except on a paper with a very smooth surface. The best surface yet found is clay, and consequently the papers used are so clay-laden that many of them are indeed little better than a clay film. Such paper

will not last, and a very slight damp or wet will at any time turn it into a hopeless mass of white mud. It certainly does not contain anything like the Society of Arts minimum of 70 per cent. of cotton flax or hemp fibre.

Moreover it is not possible to induce any thread to retain this paper in position, it has no coherence, and the binding threads run right through and away from it. The usual remedy is to inlay each plate in a surround of sound paper and rebind the whole book. To line each plate is also a possible remedy but it is a disagreeable one, as it thickens a book badly, unless the clay paper is exceptionally thin and specially prepared. Either procedure is expensive and the cost of so treating new books is prohibitive except in well-endowed libraries. Clay laden paper is a very serious danger to our modern illustrated literature, and its seriousness cannot be too strongly insisted upon—it should be utterly condemned.

Ordinary printing paper is often made with too large an admixture of mechanical wood pulp or of esparto or straw celluloses. This trouble is no new thing, but its importance has not been realised by the book-buying public. In 1898 the Society of Arts very properly drew attention to the badness of the paper then in the market, and appointed a Committee of experts to inquire into the matter. This Committee published a report, but although there is valuable material embodied in it the report is weak and does not seem to have done the least good or had the slightest effect. Esparto paper requires some plain dressing, as without it the surface is too rough and harsh to print well, and it will not bear much handling. It is laid down in the report that clay dressing may only be used safely in a proportion not exceeding 10 per cent. for papers for publication of permanent value. Personally I think that paper does much better without any wood pulp or any clay in it at all, but there seem to be strong commercial reasons for the use of both these materials in even far greater proportions than those given us as the extreme limit by the Society of Arts Committee.

Paper made with much wood pulp in it has little coherence and cannot retain the binding threads; it is more or less of the quality of blotting-paper, soft and spongy, and the leaves will not be kept in place by any threads, and they soon go to pieces completely.

If books made of this paper are sewn and bound in the ordinary manner and never used, the pages may remain *in situ*, but if at all used they will loosen out one by one, the only remedy being the very expensive one of having each page carefully inlaid within a surround of sound paper. I regret to say that this operation has in my own experience had to be done frequently with quite recent books of reference.

I believe, however, that some of the strong and excellent Japanese papers are made of wood, treated in some way that here we do not seem to understand.

Indeed I fear I may to-day repeat a statement made in 1898 by a paper manufacturer in answer to an inquiry from the Committee above mentioned, "in consequence of the rage for cheapness ninety-nine out of a hundred books of the present day will not be legible thirty or forty years hence."

The types shown in many of the British books were of much interest, because they witness that at last some of our printers are finding out that the majority of the types used during the last century are capable of improvement. There is a markedly hopeful reaction in this direction, and I am glad to be able to say that some of the Scottish firms are also making distinct progress. I think that the example of William Morris in the direction of designing beautiful types came at the right time in England, and some of the books produced under his direction showed our publishers and the public that beautiful printing was not beyond the powers of modern workmen, and now many important firms are fully alive to the higher standard of requirement expected from them.

I notice that the majority of the books were sewn with what is called "sawn-in" bands. I do not consider this is the proper form of sewing for any fine or valuable books, but it is cheaper and easier to do, and it is undoubtedly very prevalent. It involves the actual cutting away of part of the paper of the sections, and for that reason alone I should condemn it, and leaves sewn together in this way are far more likely to come out than if they are properly sewn on flexible bands, especially if the paper is not very good.

Many of the books also had false raised bands on the back. Projecting bands are necessary when a book is properly sewn, but when "sawn-in," sewn on tapes, or with "open back," then raised bands are no longer necessary, and so they are stuck on

as ornaments; but in this form they are fraudulent, as they indicate a better form of sewing than really exists.

With regard to the leathers it is only possible at present to say that without exception they all look excellent. Morocco holds easily the first place, and both in grain and crushed it shows to perfection. But the recent investigations held by experts under the authority of the Society of Arts have shown that beneath this fair seeming there may very likely be the destructive germ of sulphuric acid, which will presently reduce the beautiful leather to powder. Already there are sound leathers on the market, and we may hope for more presently; but the initial difficulty, that of bright colour, has still to be solved. The public at present would rather have a well-looking, unsound leather than a sound ugly one.

Vellum is a strong and safe material for binding books, and several bound in it were shown, the vellum being rendered transparent by a method invented and patented, on the 19th of February, 1785, by James Edwards, a binder of Halifax in England. The decoration of such binding is really only painting, which is overlaid and preserved by the transparent vellum above it. Calf is perhaps the worst of all bookbinding leathers now used; but, unfortunately, it is very popular and takes gold tooling to perfection—it is also soft and pleasant to touch. Finishers always like to work on calf, but as now prepared its life is short and it soon powders away. Already in England several libraries have regretfully given up using calf for bookbinding, all the more so because in the Middle Ages it was much used and has lasted extremely well.

The various sorts of decoration which are used now, as they have been for centuries, on bookbindings were all well represented in the exhibit of Great Britain; excellent blind tooled work, delicate and fine inlaid work in coloured leathers and glittering gold tooling, combining clever design with the utmost technical skill and delicacy, were all here. Besides the specimens of these beautiful processes done entirely by hand there were also shown several remarkable examples of reproduction of old bindings made by means of large process blocks. These reproductions were in some cases so good that an ordinary purchaser might well consider them to have been hand tooled. The idea is not altogether new, as it is likely that many of the tooled French bindings of the nineteenth century which appear

to be marvellous examples of accurate tooling were really ornamented by the impression of one large stamp.

Only a few books were shown that were illustrated with chromo-lithographs, but all these were very fine. The Americans much value chromo-lithography, but mainly in the form of large posters. It was, however, satisfactory to be able to show that in England a high standard of chromo-lithography had been reached in book illustration on good paper.

The United States excel in book illustrations printed from photographic half-tone blocks, most of them very ably re-engraved by competent artists, whose names are in most cases very properly added. I fear, however, that I must again condemn the use of the clay-laden paper which I have already mentioned above.

American typography calls for little remark; it rather reminds me of our British founts of some years back, and while many of the bindings are technically excellent, the best of the designs upon them are reminiscences of British or French work. As far as I could see, there is as yet no truly American style of design for a book cover. The exhibit generally was of a marked trade character, and only in one or two instances was anything shown of a fine or decorative kind.

In many cases it was difficult to find particular exhibits—the staffs of the various shows were imperfectly posted in what they had under their charge—indeed, except in the three cases of France, Germany and Great Britain, it may be said that the Jury had considerable trouble in this respect.

CYRIL DAVENPORT.

REPORT BY MAJOR-GENERAL JAMES WATERHOUSE,
BRITISH JUROR FOR GEOGRAPHY.

In this group there is not very much to report upon, as the great distance of St. Louis from Europe and other considerations no doubt prevented European Governments from sending cartographic exhibits, as they might have done to any European capital, and the same applies also to commercial exhibits. Consequently no sound conclusions can be made regarding the present state of cartographic work in the various countries represented in the Exhibition.

In this case, again, the exhibits, instead of being collected in one building, were scattered about all over the Exhibition, and were very difficult to find. Many of them were not displayed at all, and I missed seeing several when duties on the other Juries or illness prevented my going round with the Geographical Jury. I have only a slight knowledge of practical geographical work or surveying, and therefore can only give a brief general review of the principal exhibits in this group.

BRITISH SECTION.

The British exhibits were well arranged in the British Section of the Liberal Arts building, and comprised specimens of the Ordnance Survey Maps of the United Kingdom on various scales as detailed in the British Official Catalogue. They were awarded a Grand Prize, and were highly commended by the Jury.

The Intelligence Branch of the War Office exhibited an interesting series of maps on various scales, of Africa, the Egyptian Sudan, Sierra Leone, Uganda, the Anglo-German Boundary between Lakes Nyasa and Tanganyika. An award of a Grand Prize was made under Group 26 for the whole of the exhibits shown by the War Office.

The Hydrographical Department of the Admiralty exhibited a very choice selection of specimens of original and published charts, also a few of the special types of instruments in use in

the British Hydrographic Service. These exhibits were much appreciated by the Jury and awarded a Grand Prize.

The Royal Geographical Society exhibited a large collection of the maps that have been published from time to time in the Society's Journal, illustrating travels and explorations in Europe, Asia, Africa, America, Australasia, Arctic, Antarctic and General. Also a number of illustrations accompanying the maps; a series of portraits of Presidents of the Royal Geographical Society; miscellaneous photographs; a selection of the publications of the Society, including the Journal, special maps, etc.; photographs of medallists and Medals of the Society; a selection of instruments for explorers and geographical surveyors, as recommended by the Society and made by Cary, Porter, Ltd., London. The details of this exhibit are given in the official Catalogue. The Society was awarded a Grand Prize in Group 18, and Messrs. Cary, Porter, Ltd., as Collaborators, were awarded a Silver Medal.

The Survey of India exhibited a good representative collection of the Maps and Publications of the Department as described in the Catalogue, and were awarded a Grand Prize in Group 18, and a Gold Medal in Group 16 for photographic reproductions.

British commercial cartography was well represented by the exhibits of Messrs. Bartholomew & Co., W. & A. K. Johnston, Ltd., and Mr. Edward Stanford.

Messrs. John Bartholomew & Co.'s exhibit comprised a number of well executed Maps and Atlases illustrating the Geology of England and Wales, the Botany, Glaciation, Vegetation, Orography and Geology of Scotland; a Survey Atlas of England and Wales; an Atlas of Scotland, and a Meteorological Atlas, also Physical and Political Maps of Africa and the Nile Basin. These exhibits were awarded a Grand Prize.

Mr. E. Stanford had a very extensive collection of his well-known Maps and Publications, as described in the Catalogue, and was awarded a Gold Medal in this group, with a Silver Medal to Mr. John Bolton as Collaborator.

Messrs. W. & A. K. Johnston had a collection of Wall Maps, Atlases and Educational Appliances and were awarded by the Jury a Silver Medal. Their exhibit was not of so high a geographical standard as the preceding. They have, however, since been awarded a Gold Medal.

The Exhibits of the Cretan Exploration Fund were included in this Group, but the Jury declined to consider them, because they comprised only photographs and drawings. The general exhibit was transferred to Department N, Anthropology, and the photographs were awarded a Gold Medal in Group 16.

In the same way the Exhibit of the Egypt Exploration Fund was transferred to Department N, Anthropology.

The Palestine Exploration Fund exhibited a collection of Maps and Models, to which a Grand Prize was awarded, and a Gold Medal to Mr. G. Armstrong as Collaborator.

The Exhibit of the Royal Observatory at Greenwich of various Astronomical photographs was also included in this group, but although astronomy is the mainspring of geographical science, these photographs were not considered geographical by the Jury, and consequently were transferred to Group 16, where they were awarded a Grand Prize, together with the other astronomical photographs exhibited by the Observatory. In the same way Dr. W. E. Wilson's photographs of Nebulae, &c., were also transferred to Group 16 and awarded a Gold Medal.

AMERICAN SECTION.

In the United States Section of the Liberal Arts Building there were only four exhibits in competition for awards, the principal one being the very interesting collection of 200 Maps of the Louisiana Territory from 1528 to the present time, collected by Mr. W. Beer and exhibited by the State of Louisiana, for which a Silver Medal was awarded. Also a Relief map of City of New Orleans and Louisiana Levee System, and a model of New Orleans in 1803, both made by Miss Jenny Wilde and exhibited by the Louisiana State. A Bronze Medal was awarded for them. A Grand Prize was awarded to Messrs. Rand, McNally & Co., of Chicago, for Geographical and Educational Maps, Globes, Atlases, etc. This firm had a very good exhibit. Although their maps do not seem to come up to the best European ones in style and finish, they contain a good many practical features, and seem to be chiefly intended for educational use and office reference. They showed physical features very clearly.

G. L. Houghton received the award of a Bronze Medal for a Globe Fixture for obtaining latitude and longitude.

The principal Geographical exhibit for the United States was

the very comprehensive demonstration of the work and results of the United States Government Surveys, which was located in the U.S. Government Building. Here the maps, methods and results of the Geological, Coast and Geodetic Surveys, the Public Land Surveys and Lake Surveys, were shown and illustrated by the instruments used, and Models of Tidal Indicators, Reclamation and Irrigation Works. A large collection of Maps and Charts, Topographical, Geological and Hydrological, also of Minerals, were exhibited by the Geological Survey. Copies of the Geological Survey Topographical Map of St. Louis were being printed off in a lithographic machine and freely distributed, while in the Coast Survey Section the method of printing Marine Charts from copper plates was also shown in operation. Officers of both Surveys were in attendance to give information to inquirers. The Geological Survey had prepared for distribution as one of its series of Bulletins (No. 227) a very interesting account of the Geological Survey, its origin, development, organisation and operations during the twenty-five years since it was first founded in March, 1879. The Coast and Geodetic Survey in like manner distributed a series of thirteen leaflets relating to different branches of its work. I afterwards had special opportunities of studying the work of these Surveys at Washington and prepared a full report for the Government of India.

I have to acknowledge very cordially the great friendliness of the Officers of these Surveys in charge of the exhibits at the Exhibition, especially Prof. A. H. Thompson, in charge of the Geological Survey Exhibit and Chairman of the Jury in Group 18, Prof. Eimbeck, and Messrs. J. F. Hayford and D. M. Hoover of the Coast and Geodetic Survey, who gave up a Sunday in order to let us see the exhibits quietly and to give us all information about them.

FOREIGN SECTIONS.

France.

There were no Government exhibits in this Group, and only a few commercial ones, and those very limited in extent. The well-known firm of Erhard Frères sent a small collection of maps, including a very well-engraved chorographical map of Mexico, and was awarded a Grand Prize. M. Henri Barrère (formerly Andriveau Goujon) a Gold Medal, and M.

Joseph Forest, for an exhibit of Educational Maps and Globes, &c., a Gold Medal. A Gold Medal was awarded to Captain Paul-Jean Georgio, of the Etat-Major, Tananarivo, and a Bronze Medal to M. Philippe Bourdier, Chef du Service Topographique, Tananarivo, for Maps of Madagascar. A Bronze Medal was awarded to M. Ulyses Robert for a Map and Relief Model of La Reunion Island.

Belgium.

The War Department of the Belgian Government exhibited a small collection of atlases, geographical and topographical maps on various scales executed by the Military Cartographic Institute in Brussels. These maps, and several publications of the Institute, were placed in glass cases in the Belgian Pavilion, and not easily examined, except by special request, nor were the Jury given any descriptive catalogue of them.

The topographical maps are photo-lithographed in colours, and are thus very easily read. The collection was awarded a Grand Prize. A Bronze Medal was awarded to M. Chobert, of Brussels, for metallic maps in relief—these apparently were electrotypes from plaster casts. A Silver Medal was awarded to the Touring Club, Brussels, for an excellent series of cycling and tourist maps.

Germany.

Although there was no exhibit of topographical or other official or military maps of Germany, the Empire was very well represented in its educational and commercial geographical exhibits, shown in the Liberal Arts building, the Palace of Education, and the Agricultural building. For the number, variety and general excellence of the exhibits it certainly was the finest general collection in the group. There were no less than 27 exhibitors, against Great Britain's 10 and Brazil's 18.

In the Liberal Arts Building the principal exhibits were those of the well-known firms Justus Perthes, of Gotha, Dietrich Reimer (Ernst Vohsen) of Berlin, and Velhagen and Klasing, of Leipsig. All these also had exhibits in the Educational Section.

The house of Justus Perthes, which was founded in 1785, is perhaps chiefly known in connection with the publication of Petermann's Geographische Mittheilungen, which was started in 1855, and continues to be a valuable repertory of geographical

knowledge, well illustrated with elaborately executed maps. Stieler's Hand Atlas is another of their well-known publications ; commenced in 1816, it has passed through several editions, and a new and improved one is now under issue. In 1834 Spruner's Historical Atlas was first issued, and in 1836 Berghaus' Historical Atlas. These have all been kept up to date. The exhibits comprising copies of the above, a useful series of pocket atlases and other geographical publications, together with some special maps and other items in the Educational Building, were awarded a Grand Prize with full marks.

The firm of Dietrich Reimer (Ernst Vohsen), of Berlin, which was founded in 1845, also had a very fine exhibit. This firm engraves and sells the German Admiralty charts, and is also engaged in the preparation of maps of the German colonies in East Africa, and some of these were exhibited in the Agricultural Building. It also does a great deal of miscellaneous geographical mapping and the manufacture of globes. The exhibits included an International Geological Map of Europe on the scale of 1 : 1,500,000 ; Kiepert's Wall Maps of Ancient History, of the Physical and Political Divisions of the Globe, and Political and Physical Maps of European Countries with and without names. A special Map of Asia Minor in 24 sheets ; the larger German Colonial Atlas. Works relating to explorations and travels in the German Colonies, also in Asia and other countries. In the Palace of Education there were two wall maps by Kiepert showing all the different classes of Male schools in the German empire, and another showing the Female schools, Training-schools for teachers, Commercial High schools, and Deaf, Dumb and Blind schools, also a School map of Prussia and Waldeck, showing all the public high-schools, prepared by Dr. Killmann. A Grand Prize was awarded to the firm.

Messrs. Velhagen and Klasing of Bielefeld, Berlin and Leipzig, are the publishers of Andree's well-known Geographical Atlas and various geographical monographs, which were exhibited in the Liberal Arts Building. Also Scobel's Commercial Atlas, a handy little book, containing maps and a vast amount of statistical and other information relating to the various countries. They were awarded a Gold Medal.

Messrs. Wagner and Debes, of Leipzig, exhibited in the Educational Building, School Maps, among them a very good

one of Palestine, Atlases, etc., and were awarded a Gold Medal. Gold Medals were also awarded to J. Dinges, of Mindelheim, for very excellent geographical sections and relief models, and to Messrs. Freytag and Berndt, of Vienna, for Atlases and Charts, Pocket Atlases, Geographical and Statistical, all very good.

Silver Medals were awarded to Fritz Kindt, of Steglitz, Berlin, for a well executed relief of Vesuvius represented as a type of a Volcano, by Dr. Max Ebeling, from the geological map of the Italian topographical survey, scale 1: 20,000, also a relief of the Riesengebirge, illustrating a German chain of mountains of moderate height. To K. F. Koehler, of Leipzig, for a collection of shaded Maps showing mountain ranges and elevations, no names, but only the relief, and very well done. To the Colonial Wirtschaftliches Komité for Colonial Maps. To Emil Roth, of Giessen, for a Map of Hesse, showing the distribution of population, the relief of the ground also well delineated, together with views of Palestine. To E. Schotte & Co., of Berlin, for Globes, Tellurium, School Planetarium, Armillary Sphere, &c. To G. Westermann, of Brunswick, for excellent cheap School Atlases, an Atlas of the German Empire, and Maps by Goebler and Dirckes. To H. Wollermann, of Brunswick, for Maps of Germany, well designed for educational purposes, showing population, &c.

Among the exhibitors gaining Bronze Medals may be mentioned F. E. Wachsmuth, of Leipzig, and Messrs. Hobbing and Buchle, of Stuttgart, who both exhibited educational wall pictures, intended to explain the delineation of ground on maps, and the way in which natural objects and geographical features are represented by the map maker, and thus facilitate the reading of maps.

The extent and great excellence of this fine educational geographical exhibit is noteworthy, especially as indicating the high importance attached to geographical teaching in Germany. Whether this is the case in England I cannot say, but the very few references to geographical teaching or preparation of maps by children in the British schools enumerated in the Official Catalogue, higher, secondary or elementary, make it appear doubtful.

A noticeable feature of these exhibits, both in the Liberal Arts and Education buildings, was that the books, atlases, and

maps were all openly displayed so that they could be freely examined by visitors, instead of being shut up in glass cases, as was the rule elsewhere.

According to the Catalogue there were 33 Exhibitors, but only 27 were qualified in this Group. The Awards made were 2 Grand Prizes, 4 Gold, 9 Silver, and 6 Bronze Medals, making a total of twenty-one.

Brazil.

The Brazilian Republic was well represented in this group by eighteen exhibitors, including some of the Public Departments, and they fairly gained the credit of the finest single piece of map-work in the Exhibition. This was the large Map of Brazil, beautifully hand-drawn and coloured, and mounted in a very handsome carved frame. It must have been quite 12 feet square, and was exhibited by the Department of Agriculture, Bahia and Rio Janeiro. The map was awarded a Grand Prize. It showed the extent of the country, its coast and fluvial navigation, communications, roads and railways, telegraph lines, ironworks and the location of minerals. In the left-hand corner there was a map on a larger scale, showing the central parts of Brazil round Rio Ninas Ceraes. A Gold Medal was awarded to the Department of Agriculture and Public Works, San Paulo, for maps and relief models of that State. The Prefeitura of Rio Janeiro was awarded a Silver Medal for a very well drawn and shaded hand-drawn plan, or Cadastral map of Rio Janeiro, on the scale of 1 : 2,500, with a prettily executed water-colour view in one corner. A Silver Medal was also awarded to the Governor of the State of St. Catharina for a neatly drawn manuscript map of the State. These very beautifully hand-drawn maps were quite a feature in these Brazilian exhibits. A Silver Medal was also awarded to Messrs. Laemmert & Co., of Rio Janeiro for maps and charts.

Argentine.

A Gold Medal was awarded to the Argentine Geographic Institute, Buenos Ayres, for a general Geographic Map and an Atlas of the Argentine Republic. Bronze Medals were awarded to Pablo Ludwig and P. F. Van Damme, of Buenos Ayres, for their maps. There were only these three exhibitors.

Mexico.

Mexico was represented by nine exhibitors of maps, but the exhibits were scattered between three buildings and difficult to locate.

A Grand Prize was awarded to the Secretary for Communications and Public Works for an original hand-drawn railroad map in two sections.

A Gold Medal was awarded to the Exploratory Geographical Commission, Xalapa, for Geographical Maps of St. Louis-Potosi, also to the Cartographic Section of the Secretariat of Agriculture for Topographical Maps.

A Silver Medal was awarded to the Governor of St. Louis-Potosi, for a Geographical Map of the State in pen and ink. This was a large map embodying a good deal of information in the margin and well drawn. A similar award was made to the Secretary for War and Marine for Topographical Maps.

A Bronze Medal was awarded to C. A. Garcia for Geographical Maps, especially a very clear lithographed Oro-Hydrographic Map of Mexico, by Victor Delarey and a Chorographical Map of Mexico, engraved by Erhard Frères, of Paris, as already noted.

Austria.

There were no Geographical or Topographical maps exhibited from Austria, and the only two exhibits were from the I.-R. Ministry of Commerce and the I.-R. Ministry of Railways in Vienna, of Maps, Plans and Charts of Public Works, and Railways respectively. Both were awarded Silver Medals.

Bulgaria.

In the American Official Catalogue of the Liberal Arts exhibits no mention is made of any exhibits from Bulgaria in Group 18, but the Jury were called on to examine some maps shown in the Palace of Varied Industries in connection with the products of the Bulgarian Mineral Springs now being exploited. A Gold Medal was awarded to an excellently drawn map of Bulgaria showing Mineral Hot Springs, prepared by Engineer Kr. Nicoloff and exhibited by the Minister of Commerce and Agriculture. A Bronze Medal was awarded to Lt.-Colonel Boyadjieff for a well-executed relief map of Bulgaria.

China.

A Silver Medal was awarded for a collective exhibit of Maps of the Yellow River, and Maps and Charts of Treaty Ports, exhibited by the Imperial Chinese Government.

Siam.

A Silver Medal was awarded to the Royal Survey Department for a series of Maps of Siam, Physical Maps and Reports.

GENERAL REMARKS.

It is of course impossible to judge of the geographical value of Maps by simple inspection, they may be very beautifully drawn and finished and yet be untrue. As far as appearances went the best British and German commercial maps seem to be quite on a par, and they were the only ones from which any sort of comparison could be drawn, and that a more or less cursory and hasty one.

With regard to official maps, the system adopted by the Mexican map makers of giving a good deal of statistical and other information and geographical data in the margin of their maps seemed a good one. I was certainly unprepared to find such good examples of cartography in these southern and central American Republics—Argentine, Brazil and Mexico.

J. WATERHOUSE,
Maj.-Gen. Indian Army.

REPORT BY MAJOR-GENERAL JAMES WATERHOUSE,
BRITISH JUROR FOR INSTRUMENTS OF PRECISION.

I could only see a very few of the exhibits in this group and cannot report fully on them. I was able to help the Jury to some extent in judging and getting awards for the British exhibits, but the subject is one of which I have little practical experience.

BRITISH SECTION.

The British collection included an electrically-driven equatorial telescope, a number of new types of Surveying and Geodetical Instruments, Rifle sights, etc., exhibited by Sir Howard Grubb, F.R.S., and awarded a Grand Prize. The Cambridge Scientific Instrument Co. exhibited a selection of high-class Instruments of various kinds and were awarded a Grand Prize. A Gold Medal was awarded to Mr. A. Hilger for his exhibit of a Michelson's Echelon Diffraction Grating Spectroscope and Auxiliary apparatus; this instrument is designed for the minute analysis of the Spectrum, and specially for the observation of the Zeeman effect. This very fine instrument attracted the special notice of the Jury.

A Gold Medal was also awarded to Mr. Thomas Thorp for his exhibit of replicas of Rowland's reflection gratings; Direct-vision Pocket Grating Spectroscope; a compound Direct-vision Solar-Prominence Grating Spectroscope, and a Polarizing Solar Eye Plate.

Messrs. Newton & Co. exhibited a very fine Triple Rotating Electric Lantern—a Demonstrator's Optical Lantern—an Armillary Sphere and a large Induction Coil, 10in. Spark, and were awarded a Gold Medal.

Messrs. W. F. Stanley & Co., Ltd., exhibited a good collection of their well known surveying and drawing instruments for which they were awarded a Silver Medal.

Silver Medals were also awarded to Messrs. John J. Griffin & Co., for their new Chloroform Inhaler. To the Pulso-meter Engineering Co., for Vacuum Pumps; to Messrs. Aitchison & Co., for a collection of Binocular and Monocular Prism-Field

Glasses and other Optical Goods, and to Messrs. C. & E. Layton, for an Arithmometer.

Messrs. John Davis & Co. were awarded a Bronze Medal for Mining Dials and Lamps.

A Grand Prize was awarded to the Royal Mint, for the very fine collection of Coins, Medals, Seals, etc., exhibited and included in this Group. Its great merits and extent were very highly appreciated by the Jury.

Full descriptions of all the above exhibits appeared in the British Official Catalogue.

This British Collection, though small, was a very good one of its kind, but cannot be considered as anything like a good representation of British Scientific-Instrument making, and in fact gave no idea at all of the present state of this important industry in this country. It thus showed to very great disadvantage with respect to the fine and far more representative collection sent from Germany, and also to the American exhibits. That the standard of excellence was, however, very high is shown by the fact that out of twelve exhibitors, two were awarded Grand Prizes, exclusive of that awarded to the Royal Mint, three were awarded Gold Medals, five were awarded Silver Medals and one a Bronze Medal—in all eleven Awards. This Jury, like the others of which I was a member, was very careful in the examination of the exhibits and did its best to apportion the awards fairly.

AMERICAN SECTION.

The great majority of the American exhibits in this group were computing and calculating machines, automatic computing scales, cash registers, etc., many of them very ingenious and effective. I was only once with the Jury when examining them, but I have no experience of the working of such machines, and can say nothing about them beyond the statements of the makers.

The Arithmograph Co., of Chicago, showed a compact adding machine, weighing only 2 lbs., which could be attached to many kinds of typewriters and so connected with the numeral keys as to add figures typewritten in the column for that purpose and show totals, remaining unaffected by the use of the same numerals outside the adding column. Machines of the same kind were exhibited by the Elliot-Fisher Co., of New York City.

The Computing Scale Co., of Dayton, Ohio, exhibited computing scales for use by grocers and butchers, showing the money value of the article purchased. They are made in different styles. The Toledo Computing Scale Co., Toledo, Ohio, exhibited a scale which showed instantly and automatically the weight, selling price, and money value of any article placed upon it.

The Felt & Tarrant Manufacturing Co., Chicago, exhibited the "Comptometer," a key-operated, multiplex-order, calculating machine, performing all arithmetical problems by the mere touching, singly, or several at one stroke, of automatic direct-acting keys. The value of reliable time and labour-saving machines of this kind in business cannot be overestimated.

Of purely scientific apparatus there were not many exhibitors, and the Official Departmental Catalogue gave no information whatever regarding the exhibits.

J. A. Brashear & Co., Allegheny City, Pennsylvania, exhibited Rowland diffraction gratings and other high-class astronomical, optical and physical instruments.

The Warner & Swasey Co., of Cleveland, Ohio, also exhibited astronomical and optical instruments.

The principal exhibits of engineering and surveying instruments were those of Messrs. W. & L. E. Gurley, of Troy, New York, who supply many of the instruments used in the United States Geological and other Government surveys. I am not sufficiently acquainted with the subject to report on any special points in which they differ from English instruments of the same kind. The theodolites and transits seemed perhaps of lighter construction than English instruments, but well-constructed and high-class instruments. The firm publishes an excellent catalogue of its instruments, well illustrated and containing a great deal of useful practical information regarding their use and adjustment. Among the instruments exhibited were the Burt solar attachments for theodolites and surveying compasses, as used in the United States Geological and Public Lands Surveys for observing the true meridian instead of using magnetic compasses. These solar instruments also enable the determination of latitude, true and mean time and longitude. They can, of course, only be used advantageously in countries favoured with constant sunshine, and therefore are not much used in this country, but would be of use in India. An instrument of the kind was exhibited by Messrs. W. F. Stanley & Co.

in the British exhibit, and they tell me it has been found very useful in South Africa. It has important advantages over the magnetic needle in surveying, because lines can be run and angles measured without regard to the diurnal variation or the effect of local attraction, while the bearings being taken from the true meridian are unchangeable. The solar attachment is also applied to surveying compasses.

The same firm make improved plane-tables, particularly the Johnson Plane-table used in the United States Geological Survey, which is mounted on its tripod in a peculiar and very effective way. It has a sort of ball and socket arrangement by which the table can be levelled and then clamped, though still able to turn horizontally for orientation, and can then again be clamped by another screw in position for observing. Another plane-table known as the Gurley Plane-table is also fitted with a simple ball and socket arrangement for levelling. Alidades, or telescopic sights with rulers, are used with these plane-tables.

Messrs. Gurley & Co., also make the Price electric current-meters used in the United States Geological Survey for Hydrographic work. Their exhibits included surveying and drawing instruments of all kinds tastefully arranged in a handsome pavilion.

Another good exhibit of instruments was shown by Messrs. Keuffel & Esser Co., of New York. They make another form of solar instrument, known as the "Smith Solar attachment," which can be attached to a transit or theodolite quite independently of the telescope, and thus is in some ways more convenient than the Burt instrument. In this instrument the telescope itself forms the polar axis, and is adjusted so that its line of collimation and axis of revolution may coincide with the polar axis. It revolves in collars which are attached to the latitude arc, which has a horizontal axis, the whole being mounted on a frame attached to the transit standards. A reflector placed before the object-glass of the telescope reflects the image of the sun along the axis, and when the instrument is in adjustment it should do so throughout the day, as the polar telescope is revolved round the hour circle.

The firm also exhibited pantographic instruments, planimeters, integrators, Coradi's mechanical integraph and a coordinatograph for cross ruling on scales of 1-40 inches and 1-100 inches, besides other surveying and drawing instruments

displayed in a very tasteful pavilion. They also publish a very complete and explanatory illustrated catalogue of their instruments. There were no other important American exhibits in this group except those shown by the U.S. Surveys in the Government Building.

FOREIGN SECTIONS.

France.

France, also, was not well represented in this group. I was unable to accompany the Jury when visiting the French exhibits, and do not know what awards were given.

Instruments of Precision were exhibited by the well-known firms of Pellin, Jules Richard and Ch. Bellieni. M. Radiguet, of Evreux, showed a good collection of special glasses for surveying apparatus and for photographic colour-filters and screens. M. J. B. Baille-Lemaire, of Paris, exhibited telescopes and optical apparatus. MM. Armand Collot and Lucien Golaz, both of Paris, exhibited weighing machines and scales, and the latter other apparatus.

The instruments were arranged in small vertical cases, and it was difficult to get a good idea of the contents. A large proportion of the exhibits seemed to be ordinary optical goods.

The very fine collection of Coins and Medals, etc., exhibited by the Paris Mint, located in the Art Building, was awarded a Grand Prize. It was particularly interesting from the historical associations connected with many of the medals, their perfect execution, and, in the case of many of the more modern ones, their real artistic beauty and softness of effect. The Bureau of Art in Paris also exhibited Medals and Dies.

Germany.

The German collection of Scientific Apparatus was a very extensive one, located in the Education Building, and distributed in a suite of four large rooms and entrance hall devoted to (A) Astronomy, (B) Optics, a collection of Demonstrating Instruments for higher institutions of learning (in the entrance hall), (C) Electricity, (D) Thermometry and Meteorology.

A very complete catalogue of these exhibits was prepared, beautifully printed, and well illustrated with diagrams and figures of the principal exhibits. Copies of it were freely obtainable in three languages, German, French and English,

and most of the more important instruments are described in it.

Even this large collection, fine as it was in every branch, was considered by the German authorities as insufficiently representing the actual state of the industry in Germany, and though many of the best-known firms were represented, others were not.

Like the other German Collective Exhibits, this had more of an educational than a commercial character. The organisation of it was carried out by a Committee of technical experts and Professors from the Technical Schools of Charlottenburg and elsewhere, and it was in charge of Dr. H. A. Krüss, son of the well-known Dr. H. Krüss, instrument maker of Hamburg. Germany was also represented on the Jury by one of the Charlottenburg Professors. In fact, most of the members of the Jury except myself were technical experts, Professors of Physics or Instrument Makers.

In the introduction to the Catalogue there is a very interesting analysis of the special merits of the exhibits in each of the four groups. I can only refer very briefly to some of the more important of them.

Astronomical and Geodetic Instruments.—In this section the following may be noted. A wedge photometer for the observation of bright stars mounted like an equatorial coudé; also a micro-photometer on Hartmann's principle, which has been found very useful in the investigation of the sensitiveness of photographic plates. Both are by Otto Toepfer & Sohn, of Potsdam, to whom a Grand Prize was awarded. A meridian circle and a transit instrument, both furnished with a Repsold registering micrometer, for diminishing the error of the personal equation of the observer, and made by Carl Bamberg, of Friedenau, near Berlin, to whom also a Grand Prize was awarded. The latter instrument represents the type of instruments developed in the Kgl. Preussische Geodätische Institut in Potsdam, and used as transit instruments for determinations of astronomical time.

Zenith Cameras for determining Geographical position photographically on Schnauder's principle were exhibited by Toepfer & Sohn, and by Fechner, of Potsdam, to whom also a Grand Prize was awarded. These instruments are used for the determination of time and longitude by means of photography,

and enable accurate results to be obtained even by unskilled observers.

An important new measuring instrument made by Carl Zeiss, of Jena, is the Pulfrich Stereo-Comparator which has already proved very useful in geodetical and astronomical measurements, as well as in its application to photographic surveying, and is capable of many other scientific applications. Other instruments on the stereoscopic principle were shown by the firm, to whom a Grand Prize was awarded with full marks, and they certainly had a remarkably fine exhibit.

Fechner exhibited a pendulum apparatus with invariable pendulums, as first used by Von Sternek for the relative determination of gravity in different places, but lately much improved by allowing several pendulums to swing in vacuo. These can be observed during the whole interval between two astronomically-determined points of time, thus entirely eliminating clock errors. The instrument exhibited had four quarter-second pendulums swinging in a vacuum. The decrease in amplitude is so small that the pendulum observations can be continued for eight hours.

Several new Seismological instruments were shown, among them two horizontal pendulums, one being complete with photographic registering apparatus and intended specially for earthquake observations. It was made by J. & A. Bosch of Strasburg, who were awarded a Gold Medal. The other was a model of a horizontal pendulum on Hecker's principle, exhibited by Fechner. It can also be used for observations of the deviations of the plumb line. Among Nautical apparatus the Automatic Registering Deep-Sea Tidal Gauge, constructed by Captain A. Mensing of the Imperial German Navy, constructed to run for a month, may be mentioned. It was awarded a Gold Medal. Messrs. Siemens & Halske exhibited apparatus for reading ships' compasses at a distance, of two types.

Several German Firms exhibited Balances. The most important instrument of the kind was a standard balance for twenty kilos constructed by Stückrath and exhibited by the Imperial Normal Standards Commission. With it a mass of twenty kilos could be weighed with an accuracy of one milligram, or 1 : 20,000,000. Photographs of the new large comparator of this Institution, as well as of other measuring instruments, were shown.

There were several collections of Drawing Instruments, particularly those by Clemens Riefler, of Munich, who also exhibited a model of a standard clock with nickel steel compensation pendulum. For these he was awarded a Gold Medal. Among instruments for accurate measurements in shop work; Screw-cutting tools by Bieling, of Steglitz, Berlin, and Callipers, Standard Gauges and measures by Hommel, of Mainz. Both were awarded Silver Medals.

Optical Instruments.—In this section the latest improvements, in Photometric apparatus were shown by the Physikalisch-Technische Reichsanstalt in Charlottenburg, Krüss, and Schmidt & Haensch. One of the most important and interesting exhibits was the fine display of new kinds of optical glass, exhibited by the well-known firm of Schott and Genossen of Jena, particularly a new variety of glass transparent for ultra-violet light, which will be of the greatest use in many ways, but especially in celestial and spectroscopic photography and replacing quartz or rock-crystal for this purpose. The same firm also showed special coloured glasses for use as filters in trichromatic photography. Several large inverting prisms for photographic work were also shown. The firm was awarded a Grand Prize with full marks.

Dr. Hartmann's system of testing telescopic objectives by *extra focal* measurement, with the further process of *retouching*, was illustrated by a series of curves showing the Zonal Errors of the 80 cm. objective for the Astrophysical Observatory in Potsdam before and after the retouching by C. A. Steinheil Söhne of Munich; they showed amply the perfection attained by the method. An optical bench, specially adapted for the testing of small objectives, such as those used for photography, was exhibited by Toepfer & Sohn, being constructed on Hartmann's principle, so that each objective can be tested for that distance for which it is intended, even at infinity, without demanding an excessively long base line.

An improved form of interference spectroscope on Lummer and Gehrcke's system was exhibited by Schmidt & Haensch. It is on a new principle, using the Lummer interference rings of equal inclination which occur in a plane-parallel glass plate. Its action is somewhat similar to the Michelson echelon grating spectroscope, but attained in a simpler way. It can also be used for testing the plane parallelism of a plate.

Microscopes were well represented by Brunnee, Fuess, Leitz, Toepfer and Zeiss, the most notable exhibit being the apparatus of Siedentopf and Zsigmondy, constructed by Zeiss, by which ultramicroscopic particles can be made visible, by the aid of a peculiar system of lighting.

Two very fine pieces of large projection apparatus were exhibited in the Lecture Room, the *epidiascope* from Zeiss, and the three-colour apparatus of Dr. Miethe, made by C. P. Goerz & Co. of Berlin. The former is used for the projection of objects lying horizontally, reflected light being employed for opaque objects and transmitted light for transparent ones. Dr. Miethe's apparatus was awarded a Gold Medal.

Electrical Apparatus.—The collection of Electrical Instruments exhibited in this Section was confined to the equipment of physical and technical laboratories in the line of the most important electrical and magnetic measuring instruments. The more purely technical electrical instruments were shown in the Palace of Electricity. The principal exhibitors were Siemens & Halske, Schmidt & Haensch; O. Wolff; The P.-T. Reichsanstalt, Charlottenburg; Hartmann & Braun; Müller-Uri.

Thermometric and Meteorological Instruments.—The improvements in thermometric instruments and methods in Germany during the last ten years could be studied in this room. The most recent researches of the P.-T. Reichsanstalt in Charlottenburg have had the important object of establishing a well-defined temperature scale from -200° to $+2,000^{\circ}$ C. Electrical and optical methods have been developed for the accurate determination of high temperatures over 750° C., while electrical methods are becoming more and more important for work in the lower ranges from 750° C. to the lowest attainable temperature.

Pentane thermometers for very low temperatures were exhibited by several firms (Berger, Richter, Siebert and Kuhn), the latter two also showing improved mercurial thermometers for deep sea investigations. Quartz thermometers were exhibited by Siebert and Kuhn; they are very insensible to high temperatures and not attacked by most chemical re-agents, so that they can be used for high temperatures up to 750° C., above which electrical and optical methods must be used.

Thermo-electric elements on the Chatelier's principle for the measurement of high temperatures were exhibited by W. C.

Heraeus of Hanau a. M. One of these was of a platinum and a 10 per cent. platinum and rhodium alloy for the measurement of temperatures up to $1,600^{\circ}\text{C}$. The other was of iridium and iridium-ruthenium, for temperatures over $2,000^{\circ}\text{C}$. He also exhibited tubes of fused quartz for the protection of thermoelements against injurious gases; an iridium oven which could be heated to $2,200^{\circ}\text{C}$. and a mercury arc-lamp of quartz, specially suitable for the investigation of ultra-violet rays.

Resistance-thermometers of platinum were also shown by the Reichsanstalt. One for showing small calorimetric differences and the other for low-temperature measurements. Hartmann and Braun exhibited instruments of this kind for ordinary industrial purposes.

An optical pyrometer, on the Holborn and Kurlbaum system, was shown by the P.-T. Reichsanstalt for measuring temperatures above $1,600^{\circ}\text{C}$.

There was also a very large show of scientific glass apparatus, thermometers, areometers, chemical graduates, etc., for which Germany has long been famed, especially in Thuringia. The demands for Röntgen ray apparatus have given great impulse to the manufacture of vacuum tubes of all kinds. Dewar-flasks for storing and manipulating liquid air are also largely in demand. The principal exhibit of the two latter classes of instrument was by E. Gundelach, of Gehlberg, and a Grand Prize was awarded to him. F. O. R. Goetze and E. Greiner both received Gold Medals for glass apparatus.

Another branch of this industry has recently been developed in the manufacture of vessels and instruments of fused quartz by Heraeus and Siebert and Kuhn, as already noticed.

Meteorological instruments formed an important feature in this section. Within the last ten years great advances have been made in meteorological observations, especially in the study of the higher atmosphere by means of kites and balloons. A very complete exhibit of apparatus of this kind was made by the Aeronautical Observatory of the Royal Meteorological Institute of Berlin-Tegel, consisting of kites, rubber balloons, kite-balloons with accessories and the Meteorological registering instruments, including folding Hargrave kites, Assmann rubber balloons of 23m. capacity for carrying registering apparatus to a height of 20,000 metres, with attached parachutes to support the descent of the registering apparatus after the balloon has burst.

Registering apparatus, made by Fuess, was also shown, as used for kites and the rubber balloons, together with a triple balloon and Aspiration psychrometers by the same maker.

Atmospheric electricity is another branch of Meteorological science to which increasing attention is being given. Messrs. Günther & Tegetmeyer, of Brunswick, exhibited a number of instruments for carrying out observations of this kind according to the methods elaborated in recent years by Drs. Elster and Geitel, of Wolfenbützel. The most important of these was an aspiration apparatus for the determination of the ionization of the air in absolute units, according to Ebert, which is much used in balloon ascensions. These instruments were awarded a Gold Medal.

Terrestrial Magnetism is also an important branch of study in Meteorology, represented in this section by several of the most recent improvements in instruments for observing it, as proposed by Professor Eschenhagen of Potsdam, and very successfully used in the Magnetic observatory there, which are exhibited by Toepfer, comprising a registering declination variometer, a highly sensitive magnetic balance and accurate registering apparatus. Also the standard magnetic theodolite of the observatory, made by Bamberg, and an Inclinatorium (Dipcircle) for the determination of the vertical intensity by Tesdorpf.

Among ordinary meteorological instruments those made by Fuess from the designs of Professor Sprung were the most notable, particularly an apparatus for registering precipitation and evaporation on the principle of the sliding balance. A wind-gauge for remote stations that registers the direction and velocity of the wind for one year. A rain-gauge in which the float is connected with a registering pen. This has been found very useful in Prussian rain stations, especially along river bottoms subject to floods.

This resumé only gives a faint idea of the great extent and variety of this very admirable display of scientific instruments of precision as described in the Catalogue. It also may serve to show how largely the increased attention given to scientific studies, and their encouragement by the State in Germany have developed the designing and construction of high-class instruments in all branches of physical science, while these again form the foundation of further technical and industrial progress.

The same influences have no doubt been at work in this country also, but to what extent our English instrument makers have been able to meet the demand there was but little in this group at the Exhibition to show.

Italy.

The Department of Agriculture, Industry and Commerce sent photographs and literature regarding sensitive balances and other instruments for measuring. Michele Grasso of Genoa exhibited sensitive balances, and G. Vives of Ponce an alarm barometer.

Amsterdam and St. Petersburg.

From these cities there were small exhibits of optical goods.

Japan.

The Imperial Mint, Osaka, sent a collection of coins and medals, and Sadakichi Moritani, of Tokio, exhibited scales weights and measures.

Siam.

The Royal Mint exhibited a collection of Siamese coins, and the Royal Commission, Siamese Steelyards.

J. WATERHOUSE,

Maj.-Gen. Indian Army.

JOINT REPORT BY WALTER F. REID, Esq., AND
H. J. HELM, Esq., I.S.O.,

BRITISH JURORS FOR CHEMICAL AND PHARMACEUTICAL ARTS.

The British exhibits were of a very varied character and embraced almost every branch of chemistry and pharmacy. The various industries were represented by exhibits as under:—

The Alkali Industry	5 exhibits.
„ Alum „	2 „
„ Brimstone Industry	10 „
„ Candle „	4 „
„ Coal Tar „	7 „
„ Cyanides „	6 „
„ Electro-Chemistry Industry	2 „
„ Ethereal Oils Industry	4 „
„ Explosives „	2 „
„ Nitric Acid „	2 „
„ Paints „	8 „
„ Sulphuric Acid „	3 „
Chemical and Pharmaceutical Apparatus, Pharmaceutical and Therapeutic substances, and Antiquities relating to Pharmacy	42 „

These exhibits were compactly and effectively displayed, and this added largely to their educational value and to the effect produced on the visitors to the Exhibition. The attendants informed us that many visitors, especially pharmaceutical chemists, medical men, and members of scientific societies frequently expressed their admiration and surprise at the nature and extent of these exhibits, which had done much to dispel the illusion that Great Britain's chemical manufactures are in a decadent state.

The practical working of the low temperature exhibit of the Royal Commission, and the demonstrations and lectures by Mr. J. E. Petavel were well attended and much appreciated. A special demonstration of the preparation of liquid and solid hydrogen was given for the Jury of this group, which was so successful that more liquid hydrogen was made on that day than at any previous demonstration, although the time the Jury could give to it was necessarily very limited. The

American members of the Jury considered it as a great compliment to their nation that the British Commission should have gone to the great expense and trouble of providing such lectures and demonstrations, and declared the exhibit to be the finest in the whole Exposition.

In the French exhibits, perfumery and pharmaceutical products were well represented, and there was an excellent display of artificial silk. Artificial rubies, similar in composition to the natural gems, were also shown. The whole of the French exhibits were well and tastefully displayed, and among the most notable of the scientific exhibits may be mentioned the collective exhibit of the Société Chimique of Paris.

The German exhibits were in several buildings and were of an extensive and interesting character. They embraced the special research productions and the apparatus of numerous professors, a wide variety of colours, natural and artificial, electrolytical metals, general chemical and pharmaceutical preparations, and manufacturers' apparatus of various kinds. In many cases the exhibits were of a collective character representing special branches of industry.

There were also exhibits in this group from various States in the Union, many of which were large and effectively displayed. Also from Argentina, Austria, Bulgaria, Belgium, Brazil, China, Cuba, Haiti, Italy, Japan, Mexico, Nicaragua, Netherlands, Porto Rico, Portugal, Peru, Siam, Sweden, Spain and Venezuela, but in most of these cases the exhibits were not numerous, and where they were, as with Brazil and Mexico, especially in the former case, they consisted largely of single medicines of a secret and special character.

This group jury recommended a considerable number of awards to the British exhibits, and in comparison with other countries our exhibitors have every reason to be satisfied with the prizes. The result, on the whole, shows that Great Britain still holds a predominant position in chemical and pharmaceutical industries.

We feel that we ought to place on record the satisfaction generally expressed by the jury at the way in which the British exhibits were displayed on the occasion of their visit, and at the completeness of the information collected by the Royal Commission in connection with the various exhibiting firms.

WALTER F. REID.

H. J. HELM.

REPORT BY L. F. VERNON-HARCOURT, Esq.,
M.A., M. INST. C.E.,

BRITISH JUROR FOR CIVIL ENGINEERING AND PUBLIC WORKS.

In this Report it is proposed to give a concise sketch of the exhibits displayed relating to Public Works, for each country in succession.

BRITISH SECTION.

The exhibits from Great Britain and Ireland have been fully described in a report which I made to the Liberal Arts Committee, and which will be found on page 123.

AMERICAN SECTION.

From patriotic motives and facility of access, the United States naturally presented the most complete and comprehensive set of exhibits in the Civil Engineering Groups. The general effect, however, of the display was inevitably diminished by the exhibits having been located, for the most part, in three principal places at some distance apart, namely, the Government Exhibits in the United States Government Building, which were not put in the Official Catalogue, nor submitted for the inspection of Group Jury 26; the New York City Exhibits in the New York City Building in the Model City; and the collective exhibit of the American Society of Civil Engineers, together with various other engineering exhibits, in the Liberal Arts Building.

United States Government Exhibits.

Lighthouse Establishment Exhibits.—The Lighthouse Establishment of the United States furnished a very interesting collection of models of prominent lighthouses, fixed and revolving lenses, lanterns and lamps of various types, sirens, and a series of illuminated photographs of lighthouses and lightships. Amongst the models may be mentioned the braced, skeleton, framed iron lighthouses of the first order, at Fowey Rocks, at the northern end of Florida Reefs, and at the entrance to the South-West Pass of the Mississippi delta, and the Brandywine screw-pile Lighthouse in Delaware Bay; the masonry rock lighthouses at

Spectacle Reef in Lake Huron, showing the crib and cofferdam used in its construction, and at Minot's Ledge at the entrance to Boston Bay, rivalling the Eddystone Lighthouse in difficulty of construction, owing to the lowness and exposed position of the rock on which it is founded; and, lastly, the Five-Fathom Bank Lightship in Delaware Bay. The lenses consisted of those provided for fixed lights, of first, second, and fourth orders; and for flashing lights of third and fourth orders; but these lenses were imported from France and Great Britain, where they are exclusively manufactured by special well-known firms. The warning signals exhibited comprised a steam siren, Daboll's trumpet, and Crosby Automatic Signal.

Irrigation Department: Salt River Valley and Dam.—In the Geological Section of the United States Government Building, models were exhibited of a very remarkable work, in course of construction, for securing the irrigation of about 250,000 acres of land in an arid district of Arizona, by erecting a high masonry dam across a narrow gorge of the Salt River Upper Valley, being about double the area hitherto irrigated by the river in average years, as the river is very variable in its discharge. The reservoir formed by the dam will increase the supply of water available for irrigation by nearly 1,065 million cubic yards, thereby raising the total volume of the supply for irrigation to about 1,855 million cubic yards.

Water contained in a gravel bed, 250 to 300 feet below the surface of the flat plains of the lower valley of the Salt River, rises to within about 60 feet of the ground, and is pumped up from wells for irrigating these arid plains, electric power being generated by some falls of the river for working the pumps. A small dam has been constructed across the Salt River, about 12 miles above the site of the main dam, by which a portion of the flow is directed into a channel formed at a high level along the left slope of the rocky valley; and this water, with a fall of 225 feet at the main dam, is to be used for developing 2,500 H.P. at an electric power station to be erected at the base of the lower face of the dam, which will be first utilised for the construction of the high dam, and subsequently for supplying power to pumps for raising an additional amount of the subterranean water from wells for irrigation; and it is proposed further to increase the available power, by putting turbines in the discharge tunnels formed in the solid rock beyond the ends of

the dam on each side of the gorge, drawing water from the reservoirs as required for irrigation. The supply from these discharge tunnels will be regulated by valves placed in towers at each end of the high part of the dam, sunk by shafts through the solid rock to the tunnels.

The dam, with a length of 350 feet between the towers, and a total length, with the spillways, or waste weirs, on each side, extending to the rocky slopes bounding the gorge, of 600 feet, is designed to have a maximum height of 280 feet from the lowest part of the foundations to the crest of the high part of the dam between the towers, the sills of the waste weirs being 25 feet lower, and the deepest part of the foundations being 30 feet below the bed of the river. The water-level of the full reservoir will accordingly be 225 feet above the bed of the river at the dam; and the capacity of the reservoir, when full, will reach 1,065 million cubic yards, forming a sheet of water about 17 miles in length between the extreme ends of the branches.

The dam will rest on a very firm, close-grained stratum of sandstone, resembling quartzite; and it will be built of rubble concrete, in which this hard sandstone will be used. This dam is to be given an arched form in plan, convex upstream, which will serve as an additional factor of safety in resisting the water-pressure; for the dam will be given a cross section adequate to sustain the full water-pressure independently of its curved form. The Salt River dam, which will have a height from the river-bed to the full reservoir level, 99 feet greater than in the case of the new Croton dam, which is the highest reservoir dam in the world, but 17 feet less maximum height than the Croton dam from the deepest foundations to the top of the dam, is to have a top width of 16 feet, a batter of 1 in 20 on the upstream face, nearly vertical on the downstream face for 25 feet from the top, and then curving out with a radius of 126.4 feet to a batter of 2 in 3, whereby the width is increased to 170 feet at the bed of the river, from whence the width is increased to 180 feet at the bottom of the deepest foundations. The estimated cost of the dam is £521,000.

Sea-coast Harbour Works in the United States.—A fine series of models illustrated a variety of works of harbour and river improvement carried out under the direction of the United States Army Engineers. A relief model of Galveston

Harbour showed the former condition of the entrance, obstructed by a bar having an available depth over it of only $9\frac{1}{2}$ feet, with a rise of tide of 15 inches; and the same model showed the jetty works which have been carried out, extending the entrance channel across the sandy foreshore into the Gulf of Mexico, arresting the shoaling by littoral drift, and improving the scour along the entrance channel, which, aided by dredging at the outlet, has increased the available depth from $9\frac{1}{2}$ feet originally, up to $27\frac{1}{2}$ feet in 1903 (as shown by raising a moveable portion of the model from the entrance channel), which it is anticipated will eventually be augmented to 30 feet.

A similar model of Charleston Harbour showed the jetty works, and the resulting improvement of the entrance channel by means of a similar moveable portion; but the increase in depth has not been so marked in this case as at Galveston.

River Improvement Works.—Works carried out by the Mississippi River Commission were clearly indicated by a model of the standard bank revetment of stone pitching, or concrete facing, along the upper, steepest part of the banks down to the low-water level, with brush or fascine mattresses, sunk in place by being weighted with stone, protecting the lower and flatter portion of the slope of the banks, and extending a short distance on to the bed of the river, so as to arrest scour, especially along concave bends, endangering the levees erected behind them for restricting the area of inundations, but hitherto only partially carried out. Already, however, 1,430 miles of levees have been constructed in the State of Louisiana alone, 815 miles of which are situated along the Mississippi River, and 395 miles skirt the Red River and its tributaries.

Another model showed the spur dykes, formed of timber and fascines weighted with stone, carried out in important places, such as New Orleans, at right angles to the bank to arrest its erosion; and these spur dykes, raised in layers, decreasing in width towards the top, act like groynes, diverting the current, running close alongside the concave bank, towards the middle of the river, and thus prevent the caving in of the banks at such places, which would result eventually in the inundation of any town situated on a concave bank, and the destruction of the portion nearest the river. Other models illustrated the plant employed for the improvement of the

Mississippi, and for the removal of obstructions to navigation. The method of constructing wing dams extending out into the river from a revetted bank, as additional protection against scour, was shown by a model, two barges being moored end on to the revetted bank a short interval apart, one barge being loaded with fascines and the other with stone; and the wing dam is formed by depositing these materials in successive layers in the space between the barges.

A model of a hydraulic grader showed how an eroded river bank of very irregular surface is brought to a suitable uniform slope on the Mississippi, previously to its revetment, by removing the projecting alluvial excrescences by means of jets of water under pressure, directed against them from a barge alongside the bank. The device used for detecting obstructions in the navigable channel of the Mississippi was indicated by a model, consisting of a floating pontoon, from which horizontal steel bars are suspended, arranged in seven separate sections each 40 feet in length, by which the river-bed is swept along a total width of 280 feet; and directly one of the steel bars encounters an obstruction in its passage along the river, the opposition to its progress is made manifest by the dipping of a flag at the end of a pole on the deck of the pontoon from its ordinary vertical position, owing to the deflection of the bar, to which the flag is attached, from its position directly under the pontoon by the obstacle in the channel. The obstacles thus detected, consisting ordinarily of trunks or roots of trees, known as snags, are raised by a special vessel termed a snag boat (as exemplified by a model), provided with a long, open space, or well, down the centre of the vessel, into which the tree trunk is introduced for removal on being raised from the bed of the river.

Another model furnished a typical specimen of the hydraulic dredgers employed every year for dredging a navigable channel across sandbanks, at the low stage of the river, in certain parts of the Upper Mississippi. These suction dredgers are provided with powerful water-jets, which, stirring up the sand close to the nozzles of the suction pipes, greatly increase the amount of sand drawn up the pipes; and the sand thus raised is pumped through one or two long lines of floating tubes extending from the stern of the dredger, and discharged at their outlets into a part of the river away from the channel used for navigation. A pile sinker preceding the dredger, drives piles into the bed of

the river to serve as mooring posts for the dredger as it proceeds along the river.

A model giving a longitudinal section of the Upper Mississippi at the Falls of St. Anthony, opposite St. Paul and Minneapolis, furnished a graphic representation of the improvement of these rapids by laying a flat timber floor on the river-bed, made to a uniform slope, in place of the rocky irregularities of the natural bed.

Two models, placed side by side, exhibited the methods employed for the improvement and protection of the banks of the Upper and Lower Missouri River respectively, consisting of a revetment of stone pitching on the steeper, upper slope of the banks, and fascine mattresses covered with stone down the flatter, lower slope, and extending out a little way on to the river-bed, similar in principle to the system of revetment adopted on the Mississippi. The only apparent difference in the method of protection on the Upper and Lower Missouri River is that the slope to which the higher part of the banks is formed is steeper on the Lower than on the Upper River. In place of the spur dykes and wing dams extended out from the banks on the top of the revetment, resorted to in the Mississippi at concave bends specially threatened with erosion, or where towns have to be protected from incursions of the river, permeable dykes, as shown in a model, have been erected in the Missouri River, composed of three or four rows of piles at intervals apart, and braced together like a timber jetty, carried out into the river at right angles to the banks, and strengthened, according to the conditions of the locality, with a central, continuous row of stakes dropped vertically on to the river-bed between two horizontal lines of planks running out along the line of the jetty, these planks being fastened to the central row of piles. These stakes, whilst allowing a certain flow of water through the apertures between them, serve to divert the main current of the river in flood-time away from the threatened bank in proportion to the length of the jetty.

Dams and Moveable Weirs across Rivers.—Various forms of moveable weirs erected across rivers in the United States were very well represented by a series of models. Amongst those exhibited may be mentioned the Davis Island lock and dam on the Ohio River, five miles below Pittsburg, in which one end of the lock is closed by a sliding wooden caisson, drawn

into a chamber at the side for opening the lock; and the old form of bear-trap weir has been placed alongside the lock, with a lower shutter revolving at the bottom on a horizontal axis, which supports the upper shutter at an angle, constituting the dam, for retaining the water-level of the Ohio during its low stage.

The Pokegama reservoir dam, for storing up water at the head-waters of the Mississippi to supplement the flow in the summer, furnishes an example of a moveable weir closed by revolving segmental gates, as first adopted in Paris at the Barrage de la Monnaie. There are twelve of these gates closing openings between masonry piers; another is closed by a bear-trap; and a passage at the right side of the dam is closed by a series of vertical shutters, whereby the regulation of the discharge of water through the weir can be regularly effected, in accordance with variations in the flow of the river during its low stage, without raising any of the segmental gates.

A sectional model of a drum weir formed with timber framing, as erected recently on the Osage River, and also on the Upper Mississippi alongside Lock No. 2 at St. Paul and Minneapolis, for temporarily raising the water-level of the river above, and regulating the flow at the weir, showed this peculiar type of weir, first adopted about 1866 for the weirs on the River Marne in France, and subsequently for closing timber passes alongside the weirs of the canalised River Main, below Frankfort, a system which admits of the perfect regulation of the discharge at a weir, and which can be readily closed against a strong current.

Harbour and Canal Works on Lake Superior.—Models were exhibited illustrating some of the most important works carried out at the Great Lakes of North America, such as the Duluth Ship-Canal leading to the northern part of Duluth-Superior Harbour at the head of Lake Superior, and the concrete piers at the Superior Entry to the southern portion of Duluth-Superior Harbour from Lake Superior; the breakwater at Marquette, Michigan, on Lake Superior; and the locks on the St. Mary's Falls Canal connecting Lake Superior with Lake Huron.

The Duluth Ship-Canal, forming a direct entrance from Lake Superior to the northern part of Duluth-Superior Harbour, by cutting a channel through a spit of sand known as Minnesota Point, is a third of a mile long, and was originally constructed

in 1871 ; but it was enlarged and deepened to 300 feet in width and 25 feet in depth in 1898–1901, at a cost of about £135,420, to accommodate the large class of vessels now navigating the Lakes. The dredged trench for the canal has been lined on each side by piers, founded on bearing piles driven down 17 feet below the bottom of the trench, and formed by a substructure of timber cribs filled with rock and gravel, and protected on the channel side by 1-inch steel plating down to 8 feet below low water, on which a superstructure was built, composed of 86-ton monoliths of cement concrete deposited in situ, and increased to blocks of from 251 to 423 tons in the pier-heads.

The canal known as the Superior Entry to Duluth-Superior Harbour was originally constructed in 1867–75, with timber piers on each side along the line of the natural entrance ; and its reconstruction was commenced in 1903, having a length of 3,220 feet, a width of 300 feet, and a depth of 23 feet, and being lined on each side by concrete piers, 3,430 feet and 3,010 feet long respectively. These piers are being founded on bearing piles driven, as in the previous case, by aid of the water-jet, 16 feet into the sand below the bottom of the dredged trench ; and concrete is deposited under water, by a special bucket carried by a crane, within removeable moulds, in blocks 16 feet long, on the top of the piles, raising the piers for the most part above the water-level, so that the concrete superstructure deposited in place on these blocks, in removeable moulds, is generally laid in the dry. The estimated cost of the reconstruction of this canal is £192,710.

The breakwater protecting Marquette Harbour on the southern shore of Lake Superior, commenced in 1866, and completed in 1894 at a cost of £97,860, and having a length of 3,000 feet, was formed of timber cribs weighted with rock, and resting on a rubble mound in the deeper water. The substitution of a concrete superstructure, in place of the crib-work filled with stone, was commenced in 1895, and is still in progress, at an estimated cost of £48,530. This superstructure is built under water of face concrete blocks on both the harbour and lake sides of the breakwater, between which subaqueous mass concrete is deposited ; and on the top of this concrete, monolithic concrete blocks are formed in situ, in 10-feet lengths, having each a capacity of 36·1 cubic yards, which raise the breakwater to its full height.

The St. Mary's Falls and Sault Ste. Marie Canals and Locks.—The St. Mary's Falls Canal was first commenced in 1853 by a Company, for forming a navigable connection along the southern, United States, bank of the St. Mary River, between Lake Superior and Lake Huron, and, consequently, with Lakes Michigan and Erie, so as to avoid the rapids of the St. Mary River opposite Sault Ste. Marie, the difference in level of the two lakes having been surmounted by two locks, each having a lift of 9 feet, a length of 350 feet, a width of 70 feet, and an available depth of $11\frac{1}{2}$ feet; and this canal was opened in 1885, having cost about £208,300. The Weitzel Lock was constructed by the Government in 1870–81, with a length of 515 feet, an entrance width of 60 feet, increased to 80 feet in the lock-chamber, and a depth of 17 feet over the sills, with a single lift of 18 feet. The canal also, $1\frac{1}{12}$ miles long, was enlarged at the same time, from a bottom-width of 64 feet and a width at the water-level of 100 feet, to a mean width of 160 feet, the side slopes pitched with stone being replaced by vertical timber piers; and the depth of the canal was increased from 13 feet to 16 feet. This lock cost approximately £208,300, and was named after the United States Engineer officer in charge of the works. The Poe Lock, also named after the officer in charge, was constructed in 1887–96 on the site of the old locks, 800 feet long, 100 feet wide, and with 22 feet depth of water over the sills, at a cost of about £625,000. The canal also has been deepened to 25 feet since 1892; and by the extension of the piers at the entrance, the length of the canal has been increased to about $1\frac{1}{2}$ miles.

The widening and deepening of the St. Mary's Falls Canal cost approximately £625,000; and the improvement of the channel of the St. Mary River through shoals of sand, clay, boulders, and sandstone and limestone rock, along a length of 34 miles, so as to provide a navigable depth of 19 feet for a minimum width of 300 feet, involved a similar expenditure of £625,000.

The lateral ship-canal on the northern, Canadian, side of the St. Mary River, known as the Sault Ste. Marie Canal, is $1\frac{1}{8}$ miles long, 150 feet wide, and 22 feet deep, and has a lock for surmounting the difference of level of 18 feet, 900 feet long, 60 feet wide, and affording a depth of 22 feet of water over its sills. This canal was constructed in 1888–95, at a cost of about £833,300. The American locks are worked by hydraulic power;

whilst the Canadian lock is worked by electricity generated by water-power at the falls.

The freight traffic through these two canals has increased very rapidly in recent years, with only occasional slight fluctuations, having attained a maximum of 35,961,146 net tons in 1902; and though this traffic fell in 1903 to 34,674,437 tons, owing to a falling off of iron-ore shipments, it exhibits a considerable increase on the freight traffic of 1901 of 28,403,065 net tons. The net registered tonnage passing through the St. Mary's Falls Canal in these same years amounted to 24,626,976 tons in 1901, 31,955,582 tons in 1902, and 27,736,444 tons in 1903, which last figure when compared with 507,434 tons in 1863, 1,204,446 tons in 1873, 2,042,259 tons in 1883, and 8,949,754 tons in 1893, shows how great and steady has been the increase of traffic in the last forty years on this waterway.

City of New York Exhibits.

On the lower floor of the New York City building were collected a most interesting series of models of methods of street cleaning and refuse destructors; the mode of construction of bulkheads and piers for the accommodation of shipping; Brooklyn and Williamsburg bridges with sections of their main cables, and one of the piers and towers of the Manhattan bridge; and also an express station of the New York subway, with a full-sized section of the cast-steel pillars supporting the roadway overhead. The upper floor was devoted to models of the old and new Croton dams, the central distributing gate-house at the Jerome Park reservoir, and sections of the new Croton aqueduct, with a large number of framed photographs of the new Croton dam works, and the aqueduct and other works in connection with them, at various stages of progress.

New York River Bridges.—Brooklyn Bridge with its approaches has a total length of 5,990 feet; and its central span over the East River is 1,595 feet, which is suspended from four steel-wire cables passing over two towers raised 270 feet above high water and resting upon piers founded on a stratum of rock 45 to 80 feet below the bed of the river, and is also partially carried by auxiliary cables extending out like fans towards the centre of the large span, and which, passing over the towers, assist the main cables in supporting the minor spans on the shore side of the piers. The main cables are each composed of

2,096 steel wires of No. 6 gauge, bound close together without any twist, and have an ultimate strength of 4,600,000 lbs. The bridge affords a headway of 135 feet above high water in the centre of the large span, decreasing to 100 feet at the piers. Its platform has a width of 85 feet; and it accommodates a roadway along the outer sides, on each of which an electric tramway runs, a rope railway conveying frequent trains composed of four large cars on the inner side of each roadway, and a central elevated footway. Brooklyn Bridge was erected in 1870-89, at a cost of about £3,000,000. The crowded state of the trains and tramways running at very brief intervals over Brooklyn Bridge, and also of the footway, just before and after business hours in New York, shows very forcibly how much additional means of crossing the East River are needed, in spite of the numerous ferries plying across the River.

In the endeavour to meet this continually growing need, the Bridge Department of New York City commenced the construction of Williamsburg Bridge in 1896, which was completed in September, 1904, at a cost of about £2,300,000. It crosses the East River about $1\frac{1}{2}$ miles higher up than the Brooklyn Bridge, which it resembles in several respects. Its platform is suspended from four main cables passing over two towers resting upon piers in the river, and raised 333 feet above high water. The bridge has a central river span between the towers of 1,600 feet, 5 feet greater than the span of the Brooklyn Bridge; and it provides the same headway of 135 feet above high water in the East River at the centre of the span. The auxiliary cables of the Brooklyn Bridge are omitted in the Williamsburg Bridge, where the side spans from each pier to the river bank are borne by girders continuous with the girders suspended from the cables across the large span, and carrying the roadways of the bridge, 110 feet in total width, or 25 feet wider than the Brooklyn Bridge; and, accordingly, the cables of the Williamsburg Bridge have had to be given a greater strength, being each formed of 5,262 untwisted steel wires of No. 7 gauge, having an ultimate strength of 22,400,000 lbs. The towers of this bridge are of open braced steel-work, resting on the two masonry river piers raised up to high-water level. This bridge provides two footways and roadways on the outer side, and four tramway lines in the centre; and above the tramway lines there are two elevated railway lines in the middle, and

an elevated bicycle track on either side. The bridge, with its approaches, has a total length of 7,200 feet, or 1,210 feet longer than Brooklyn Bridge.

A third suspension bridge is in course of construction across the East River, between Brooklyn and Williamsburg bridges, known as the Manhattan Bridge, commenced in 1901, the masonry river piers of which have been already raised above the water-level. Its design resembles the Williamsburg Bridge, with openwork, braced, steel towers on the masonry river piers : and it is to be similar in width of roadway ; but the large span between the river piers will be only 1,470 feet, or 130 feet less than that of the Williamsburg Bridge ; whereas its total length, with approaches, will reach 9,900 feet, or 2,700 feet longer than the Williamsburg Bridge.

In addition to the three suspension bridges just described, an arched steel bridge, with two spans of 510 feet, was erected by New York City in 1886-90, one arch crossing the Harlem River to the north of the East River, affording a headway of 135 feet over the river in the centre of the arch, and the other passing over the New York Central and Hudson River Railway and some adjacent land. This bridge, known as Washington Bridge, connects Manhattan Island, near its northern extremity, with the mainland ; it has a total length of 2,400 feet ; and it cost about £562,500. A further connection between Manhattan Island and Long Island, across the East River, is being carried out about 3 miles to the north of Williamsburg Bridge, opposite Long Island City, by the erection of a cantilever bridge, commenced in 1901, where the East River is divided into two channels by Blackwell's Island, from which the new bridge takes its name. The intervention of the island has enabled the bridge to be divided into five spans, one extending over each bank, one over the island, and one river span over each channel, these two river spans being 1,182 feet and 984 feet respectively ; whilst the total length of the bridge, with its approaches on each side, is 7,450 feet. This Blackwell's Island Bridge, approaching completion, is designed to carry four lines of railway, two roadways, and two footpaths ; and its estimated cost amounts to £3,750,000.

New York Subway.—In order to increase the means of communication between the southern business quarter of New York and the residential districts constantly extending to the northern

part of Manhattan Island, as the electric tramways and elevated railways are already becoming over-crowded at certain periods of the day, an underground railway, termed the "New York Subway," or "Rapid Transit Railroad," has been constructed, with a total length, including a branch, of about $20\frac{1}{3}$ miles, at a cost of about £7,300,000, having been commenced in 1900; and it was opened in October, 1904. The subway starts at present at City Hall Park, and, curving a little, runs north along Elm Street, and then nearly direct by La Fayette Place to Fourth Avenue, which it follows to the Central Station, where it turns at right angles, pursuing a westerly course under East 42nd Street, till, on reaching Broadway, it resumes a northerly direction under it, and along the line of its extension, Broadway Boulevard, as far as Kingsbridge. A branch line diverges from the main line at the intersection of West 104th Street with Broadway Boulevard, following this street with an easterly course to Central Park, a corner of which it crosses diagonally to reach Lenox Avenue, under which it runs in a northerly direction till, on nearing the Harlem River it curves round towards the east, and crossing the river, follows the line of East 149th Street and Westchester Avenue, and then trending north again, it terminates at Bronx Park. The main line is about $13\frac{2}{3}$ miles long, and the branch line $6\frac{2}{3}$ miles. The railway runs just below the streets for $12\frac{1}{4}$ miles, the roadway being borne on brick arches springing from girders spanning the railway at short intervals, and supported by steel pillars standing on a concrete bed at the sides and in the spaces between the lines of way. It is in regular tunnel, at some depth in places below the surface, for $3\frac{1}{4}$ miles. The main line is elevated on a viaduct in crossing the Manhattan Valley between 125th Street and 135th Street; and it is again raised on a viaduct, like the elevated railways, from Fort George to its termination at Kingsbridge; and the branch is also carried on a viaduct from Westchester Avenue to the end of this line at Bronx Park. Four lines of way are laid down along the first $6\frac{1}{4}$ miles of the Subway, the two central ones serving for the express service of trains, running at an average speed of 30 miles an hour, at intervals of about 2 minutes at the busiest periods, and the two outer lines for the ordinary trains stopping at every station, running at about half the speed of the express trains including stops, but at shorter intervals apart. The express trains only

stop at certain important stations along the route; and at these stations, such as for instance Brooklyn Bridge Station, and 42nd Street and Madison Avenue Station, situated from 1 mile to $1\frac{1}{2}$ miles apart, there are central platforms serving the express lines, which can be reached by passengers coming from an intermediate or local station, by crossing over the local line from the local side platform to the central express platform. At the local stations, only about $\frac{1}{4}$ mile apart, there is only a local platform on each side of the station, serving the stopping trains; whilst the express trains run through on the two central lines. The trains are run by electricity supplied to a third rail, thereby avoiding the smoke and dirt resulting from using locomotives, as well as providing a more rapid starting and stopping of the trains; whilst white bricks and white paint ensure the reflection of as much light as possible along the line. Moreover, the underground stations, in the portions of the line just below the roadway, are lighted in suitable open spaces or footways by skylights of thick glass; whilst electric incandescent lamps supply artificial illumination where necessary during the day, as well as night-time. The four lines of way extend along the main line to the place where the branch line starts; and from thence, three lines of way are continued for 2 miles along Broadway Boulevard, and across Manhattan Valley to 145th Street, being reduced there to two lines for $2\frac{1}{2}$ miles, mostly in tunnel, on emerging from which on to a viaduct, three lines have been laid down along the remainder of its course. The branch line has two lines of way where it is under ground for the first $3\frac{2}{3}$ miles; but three lines have been provided on the viaduct carrying the latter part of the line.

Water-Supply of New York City.—A wooden model of the old Croton dam, over 60 years old, showed the old dam as it existed before it had to be rebuilt after the great flood of the 7th and 8th of January, 1841. Three sectional models of the new Croton aqueduct as constructed in 1885–91, showed, firstly, the “horseshoe” section where the aqueduct was tunnelled through solid rock, with a cross section equivalent to a circular area having a diameter of 14 feet, through which the water is not intended to be discharged under pressure; secondly, the timbered section of the aqueduct where carried through decomposed rock or through earth, similar in form and capacity to the horseshoe section; and, thirdly, a circular section, $12\frac{1}{4}$ feet

inside diameter, through which the water is discharged under a head ranging from 35 to 255 feet. This section extends from Van Cortlandt Park to 135th Street and Convent Avenue, except for a length of 1,266 feet, where it is carried as an inverted syphon under the Harlem River, in which the section of the aqueduct is reduced to $10\frac{1}{2}$ feet diameter; and the syphon crosses under the river-bed at a depth of 11 feet below high water. A photograph of High Bridge, a fine masonry structure with a number of arches, furnished a contrast of the method of carrying the water-supply of the old aqueduct at a high level over the Harlem River, with the new method of conveying the flow through the new aqueduct in a syphon at a considerable depth below the river-bed. The old aqueduct can discharge 95 million gallons a day, and the new aqueduct nearly 300 million gallons daily. The central distributing gate-house at Jerome Park reservoir in the borough of the Bronx, of which a model was exhibited, serves to distribute the whole of the water supplied by the old and new aqueducts amongst the different sections of the reservoir, or can pass it straight into the water-mains of the city. Maps and plans indicated the extent of the Croton watershed, the various reservoirs and lakes in it, the lines of the old and new aqueducts, the Bronx pipe-line and the larger water-mains in New York City, an elevation and plan of the new Croton dam, and plans and profiles of the Muscote dam. The object of this last work, in progress at Muscote Mountain near Katonah, is to keep the flat lands at the head of the new Croton reservoir flooded, especially during hot weather, on sanitary grounds.

The new Croton dam was well illustrated by a model representing it in its completed state; and though some delay has been caused by the extension of the masonry dam along the greater portion of the length on the left slope of the valley, for which an earthen dam with a central masonry core wall had been originally designed and partly carried out, it is probable that the work will have been sufficiently advanced to impound and use a portion of the water during the winter of 1904-5 and that the dam will be completed in the course of 1905. This dam, mainly built of rubble granite masonry, and the extension of rubble granite concrete along the lower portion, is the highest masonry dam in existence, the deepest foundations extending 155 feet below the surface of the ground on the down-stream

side, and attaining a height of 142 feet above it at the crest of the dam, making a maximum height of 297 feet. The regular dam is 1,168 feet long; and an overfall, and a spillway bending back upstream parallel to the right slope of the valley, have a total length of 1,000 feet, of which 250 feet have their sill 20 feet below the crest of the dam. The dam has been made 206 feet thick at the base of its deepest section; and a public roadway, 20 feet in width, is to be formed along the top of the dam. The new Croton dam will impound 30,000 million gallons of water; and when this dam and some other works in progress are completed, 72,000 million gallons will be stored within the Croton watershed; whilst the Jerome Park reservoir provides a storage capacity of 1,850 million gallons.

American Society of Civil Engineers Exhibit.

A very fine collective exhibit of engineering works was displayed by the American Society of Civil Engineers in their rooms in the Liberal Arts Building, consisting of framed photographs and views of bridges and other constructions, bound volumes, portfolios, and photographic albums, plans, detailed drawings, specifications, and illustrations of various works, and maps of Brooklyn drainage, the Geological Survey, Yellowstone Park, and the cities of St. Louis, New York, Washington, and Philadelphia, together with statistics, a historical sketch, and the Transactions of the Society. In addition to numerous steel girder and arched railway bridges over the Mississippi, Missouri, and other rivers, including the St. Louis Merchant's Bridge crossing the Mississippi with three spans of 500 feet, the Plattsmouth Bridge with a span of $401\frac{1}{2}$ feet over the Missouri, the Minneapolis Bridge over the Mississippi with a central span of 320 feet, and the New Westminster Bridge over the Fraser River, British Columbia, the collection contained photographs of the Page Bascule Bridge at Chicago, a draw-bridge over the Missouri at Omaha, and a concrete arched bridge with three spans of 160 feet across the Big Muddy River, Illinois. There were also illustrations of the water-works improvements at Cincinnati, the water-power works at Niagara Falls, Hannawa Falls, and Shawinigan, tunnel works, high steel frame buildings, and the electrical and steam equipment of the New York Subway. The exhibit, moreover, was made still more comprehensive by contributions from foreign members of the

Society ; for Mr. Bell of Carlisle furnished drawings of skew masonry arched bridges for roadways ; Mr. Moncrieff of Adelaide supplied a plan of Port Adelaide Harbour, and drawings of improvements in progress ; and Mr. A. W. Robinson of Montreal exhibited photographs of four large dredgers and dredging machinery, employed for deepening the navigable channel of the St. Lawrence.

Various American Civil Engineering Exhibits.

A large model of the South-west Pass Lighthouse at the mouth of the Mississippi occupied the centre of the Liberal Arts Building. An interesting model of New Orleans and the adjacent country showed the levees and dykes which have been constructed to arrest the wanderings of the channel of the Mississippi, resulting from the erosion of its concave banks, and to protect the city from inundations. The Chicago Drainage Canal, 28 miles long, which has diverted the sewage of Chicago from Lake Michigan into the Mississippi River basin, by connecting Chicago and its sewers with the Desplaines River, and is also designed to constitute the first portion of a deep waterway between the Great Lakes and the Mississippi, was well illustrated by models, plans, and photographs.

Some most important railway works in progress were represented by excellent models, namely, the Quebec Bridge in the Liberal Arts Building, exhibited by the Phoenix Bridge Company, of Phoenixville, Pennsylvania, who are erecting the bridge, the Union Station at Washington, D.C., and the New York Terminal Station, together with the tunnels under the Hudson and East Rivers in connection with it, both exhibited in the Transportation Building.

Quebec Bridge over the St. Lawrence.—The cantilever bridge in course of construction across the River St. Lawrence at Quebec is designed to have a central span of 1,800 feet, with a counterpoising cantilever span of 500 feet on each side, stretching out from the river pier to the bank, and an approach span of 210 feet over the slope of the bank at each end of the bridge. The central span is 90 feet longer than the two large spans of the Forth Bridge, which are at present the greatest spans in the world. The Quebec Bridge is to be given a width of 80 feet, so as to afford sufficient space for a double line of railway, two lines of tramways, two roadways, and a footway

at each side. There is to be a clear headway under the bridge for navigation of 150 feet above high water in the river; and the weight of steel required for the bridge amounts to 35,000 tons.

Washington Union Station.—The New Union Station at Washington, now being erected at the intersection of Massachusetts and Delaware Avenues, half a mile from the halls of Congress, and with a frontage facing the central Dome of the Capitol, is approached across a plaza sloping gently down away from the station, and intended to be decorated by balustrades and fountains, to which nine streets converge. The plaza is 500 feet wide and 1,000 feet long, and is separated from the forecourt of the station by a terrace, about 100 feet in width, surrounding the building. The station building is designed to be 620 feet in length, and from 65 to 120 feet high, and is being built of white granite in a classical style of architecture, adapted from the triumphal arches of Rome, with its three entrance archways 50 feet in height, so as to conform to the classic architecture of the public buildings in Washington, and to serve as a fitting approach to the centre of the Capital of the United States; and the eastern end is to contain a suite of apartments exclusively devoted to the use of the President and the guests of the nation. The general waiting-room, 220 feet long and 130 feet wide, will have a vaulted roof, affording a height of 90 feet, and decorated with sunken panels like the Baths of Diocletian; and ready access from this spacious hall to the various rooms and offices is provided by arranging them round it. The dining-room, 100 feet long, 80 feet wide, and 35 feet high, is to be in Pompeian style; and the passengers will be freed from the smell of cooking by placing the kitchen on the second floor.

Owing to the differences in the inclines of the streets, the luggage will be conveyed in vans to the basement, and thence distributed by automobile trucks, running on tracks below the railway lines, to lifts near the further end of the trains, by which they will be raised to the platform level for storage in the luggage vans; and by this means the luggage will be kept out of the way of the passengers. The lobby in which passengers congregate to obtain access to the several platforms is to be 760 feet long and 130 feet wide, having an arched ceiling in a single span; and passengers can pass from the terrace of the

plaza to any part of the station or platforms at a uniform level, without a single step.

Thirty-three lines of way are to come into the station, for twenty of which, being on a level with the waiting-room, the station will constitute a terminus ; whilst the remaining thirteen lines of way, laid 20 feet below the level of the waiting-room and approach, will serve as through lines. Only eight of the latter lines will be at first used for passenger service, to which access will be provided by flights of steps ; and the other five will be employed for the mail service and sidings, till the growth of traffic necessitates their being utilised for passengers. Platform roofs stretching partly over the trains, are to be used for sheltering the passengers, to avoid disfiguring the city and dwarfing the dome of the Capitol by large-span station roofs. The approach to the station from the north will be by the present Baltimore and Ohio Railway down Delaware Avenue, and from the south by an extension of the existing Pennsylvania Railway in tunnel under Capitol Hill, at a depth of about 56 feet below its summit, and under First Street North-East, and the new plaza, to the low level lines.

The total cost of the new station, extension of railways, and contingent works, is estimated at about £2,916,000, towards which the Government contributes £625,000, in consideration of the abolition of level crossings, and shares with the District of Columbia the expenses of the plaza, and the formation of three new streets converging to it.

Pennsylvania, New York, and Long Island Railway, and New York Station.—The insular position of New York, which renders it so convenient for ocean-going trade, on account of the ample space available for deep-water quays, close to the open sea, but well sheltered from it, has made it difficult of access for railways from the west, owing to its being separated from the mainland on that side by the broad Hudson River, in reality an arm of the sea. Consequently, up to the present, the only main lines of railway possessing a terminus in New York are the New York Central and Hudson River, and the New York, New Haven, and Hartford Railways, running from the Grand Central Station northwards, and crossing over the comparatively narrow Harlem River to the mainland to the east of the Hudson River, which is first crossed by a cantilever bridge at Poughkeepsie, and subsequently by the first-named railway at Albany.

The Pennsylvania Railway, accordingly, forming the main route to the west, and the other western lines of the mainland, have hitherto had their termini on the western shore of the Hudson River at Jersey City and Hoboken, necessitating the conveyance of passengers and merchandise to and from New York by ferries across the Hudson. To obviate this impediment to traffic, and to provide a railway terminus in New York itself, the works for a tunnel under the Hudson River were commenced in 1874; but the difficulties encountered in carrying forward the tunnel through silt and sand, and insufficiency of funds, led to the stopping of the works, which were only completed in 1904; and a suspension bridge of very large span was also proposed for bringing the western railways into New York. Two single-line tunnels are now being constructed under the Hudson River, New York, and the East River, in order to enable the Pennsylvania Railway to run into a large underground station in the centre of New York, now in course of construction, and proceed as far as Long Island. These tunnels have been carried forward, like the tubular tunnels in water-bearing strata under London, and under the Thames at Blackwall, by means of a shield and compressed air, the cast-iron rings forming the linings of the tunnels being erected under the shelter of the hinder part of the shield, and the tube thus formed prolonged as the shield is pushed forward. In order, however, to prevent any slight settlement of the tube in the soft silt affecting the line, and to provide against the weight and motion of the passing trains producing settlement where the tube traverses silt, the line is borne along these parts on iron piles driven through the silt down to rock or other solid stratum.

The site already cleared for the new station is bounded by the Seventh and Eighth Avenues on the east and west, and by 31st and 33rd Streets on the south and north, with frontages of 430 feet on the avenues, and 780 feet on the streets. The station proper, with its various rooms and offices, is situated on a floor 20 feet below the level of the streets, to which carriages are to descend by a gentle incline, and passengers by flights of steps. The general waiting-room, 320 feet long, 110 feet wide, and 150 feet high, together with the ticket offices, parcel rooms, telephones, etc., located in it, will occupy the centre of the site. An arcade of shops will lead from the main entrance, in the centre of the Seventh Avenue

front, to the general waiting-room, at the end and sides of which the refreshment rooms will be situated ; and two sub-waiting-rooms to the west of the main room, each 100 feet long, 58 feet wide, and 58 feet high, will be provided with all the requisite conveniences. The railway lines coming from the tunnels are about 40 feet below the level of the streets ; and access will be obtained to the various platforms by flights of steps leading from the station lobby, or "concourse," consisting of a covered passage, over 100 feet in width, opening out of the general waiting-room, and extending along the whole width of the station and under the adjoining streets. The main luggage room, to the east of the general waiting-room, will occupy the whole of the space under the arcade and restaurants, affording 450 feet of frontage for the luggage vans ; and automobile trucks running along a passage, 30 feet wide, extending the whole length of the station on the south side, will convey the luggage to the lifts, descending to each platform at the east and west ends of the station. By this arrangement the passengers and luggage will be kept distinct, as at the Washington Union Station, with the luggage in this case distributed on a floor above the platforms.

FRANCE.

The French exhibits were somewhat scattered ; for whilst the exhibits of private engineering firms were grouped together in the Liberal Arts Building, those of the City of Paris were collected in another building, and those of the Public Works of the French Colonies were placed with their agricultural exhibits in the Palace of Agriculture.

Government Exhibits.

General Levelling of France.—Copies of all the documents relating to this important work were exhibited by the Ministry of Public Works of France.

École des Ponts et Chaussées, Paris.—The exhibit of this Institution comprised the published lectures delivered by the Professors ; the fine work, "Ports maritimes de la France," giving a description, with charts and illustrations, of the sea-ports of France ; and an apparatus for measuring the strains of extension and compression of a metal, without having to make a correction on account of the flexion of the samples, and for making the measurements on a length of $\frac{1}{2}$ inch with at least

equal precision as with the ordinary apparatus on double that length.

French Colonial Public Works Exhibits, Algerian Ports.—Plans showed the works which have been carried out by the French Government for sheltering the ports of Algiers and Oran by means of large breakwaters.

Madagascar.—The Public Works which are being carried out between Tananarive and the sea were indicated by a series of photographs.

City of Paris Exhibits.

These exhibits comprised the water-supply of Paris, its sewerage, and the disposal of the sewage by irrigation, books relating both to the water-supply and sewage disposal of the City, the Paris Metropolitan Railway, and street paving and cleaning, affording a very complete record of the various works carried out by the City, and the results accomplished.

Water-Supply of Paris.—A small-scale map showed the several conduits which bring spring water, mainly derived from the chalk, from near the sources of Vanne, the Dhuis, and the Avre, small tributaries of the Seine, for the domestic water-supply of Paris. Plans, also, of Paris indicated the zones of distribution of the spring water and the river water respectively, though the latter is now for the most part used for public purposes, such as watering the streets, flushing the sewers, and supplying the public fountains. A graphic diagram giving the mean daily volume of water delivered in Paris for each month since 1860, manifested the gradual increase in the consumption; whilst another diagram showed the mortality from typhoid in Paris since 1880.

Drainage of Paris.—The network of Paris sewers were represented on a general plan; and statistics were furnished of the population, number of houses, water-supply, sewage, sewers, the various systems of disposal of sewage and refuse of all sorts, and the mortality since 1800. A general plan showed the arrangements for irrigating certain lands in the Lower Seine valley with Paris sewage; and analyses were supplied of the sewage water, the general drainage water, and the spring water. In addition, a number of photographs represented various works and operations relating to the cleansing of Paris.

Books relating to the Water-Supply and Sewerage of Paris.—The publications exhibited included the well-known books by

M. Belgrand on the hydrology of the Seine basin, the Roman aqueducts, the ancient and modern water-supply of Paris, and its sewers and refuse disposal, the work by M. Bechmann, Engineer-in-Chief to the City of Paris, on water-supply and sewage disposal, a report on the water-supply and sanitation of Paris in 1900, other books on special portions of the same subjects, and collections of plans of the conduit bringing spring water from the valley of the River Vanne, of the watermains of Paris, and of the sewers of Paris in 1904.

Paris Metropolitan Railway.—A general plan showed the various lines of the Metropolitan Railway, partially completed, which consists, firstly, of a roughly circular line following the outer boulevards encircling the central part of the city, about half-way between the Chemin de Fer de Ceinture and the centre of the city, crossing the Seine twice, and about $14\frac{1}{2}$ miles in length; and, secondly, of two main lines running right across Paris, approximately from north to south and from east to west, together with two minor cross lines. The total length of the railway, as at present authorised, will be nearly 39 miles, of which $27\frac{1}{4}$ miles will be underground, for the most part just under the surface of the streets, $5\frac{1}{2}$ miles in open cutting, and $6\frac{1}{4}$ miles on viaducts. The drawings exhibited related chiefly to the works of the line first constructed, and opened in 1900, running from the Porte de Vincennes under the Rue du Faubourg St. Antoine, de St. Antoine, de Rivoli, and the Champs Élysées, to the Place de l'Étoile, with a prolongation to the Porte Maillot, a branch to the Porte Dauphine, and an extension to the Place du Trocadéro forming a short portion of the circular line; and they comprised plans of the works under the Place de l'Étoile, de l'Opéra, and de la Nation, cross sections of stations under the Rue de Rivoli, standard works in tunnel and on viaduct, diagrams of the traffic, and photographs. The circular line, constructed in 1900–1903, was also illustrated by photographs. The railway is worked electrically; but though laid to the standard gauge, the tunnels have been purposely made too narrow to admit the rolling-stock of the ordinary railways in connection with it, and on to which its trains can run. The different lines are worked independently to avoid delays at junctions, with exchange stations at the intersections; and the terminal stations are provided with loops to dispense with shunting. The stations are placed about a third of a mile apart;

and the trains are run at intervals of 3 minutes by day, and 6 minutes at night, at an average speed of about 13 miles an hour. The total cost of construction of the whole railway has been estimated at £6,600,000.

Street Paving and Cleaning in Paris.—Numerous samples of wood blocks employed or tried for wood-paving were exhibited, and also specimens of ordinary, creosoted, and special paving; whilst a drawing and photographs of a sweeping-machine, drawings of a motor water-cart, and a complete set of tools used by the paviors, indicated the methods employed for cleaning and repairing the Paris streets. Moreover, MM. Durey-Sohy exhibited models of street-sprinklers and sweeping-machines which they make for the city.

Various French Exhibits.

Société des Ingénieurs Civils de France.—This well-known Society, mainly for French engineers and contractors who are not in the regular service of the Government, presented copies of their Proceedings and Reports from the foundation of the Society, in 1848, up to the present time.

Lighthouse Apparatus and Appliances.—A very fine and comprehensive exhibit was shown by MM. Barbier, Bénard, et Turenne of Paris, the most noticeable feature of which was the collection of lenses and machinery for flashing lights. These comprised: (1) A flash-light of the 2nd Order showing two white flashes every 10 seconds, formed of two groups of two lenses with excentric axes, lighted by incandescent petroleum vapour with mantles of $3\frac{1}{2}$ inches diameter, and conforming to the requirements of the Lighthouse Service of France. (2) A 2nd Order flash-light emitting a simple white flash at intervals of 5 seconds, provided with four symmetrical panels of lenses of 90° , and otherwise similar to the previous apparatus. (3) A provisional apparatus of the 4th Order, giving at will all the characteristics of flash-lights, lit with a petroleum lamp of two wicks. (4) A petroleum flash-light of the 4th Order, burning and revolving continuously for two months without attention, the rotation being produced by a magneto-electric motor, whose induction coil is in direct connection with the vertical axis of the platform supporting the optical apparatus, and completes a revolution every 10 seconds; and the electric current is produced by a potash and oxide of copper battery, whose electro-

motive force is practically constant. Apparatus was also exhibited for search lights for the protection of coasts, and for ship lights; and drawings were displayed of metal light-towers, lighthouse apparatus, lightships with their optical apparatus carried by a sort of compound pendulum to prevent its rolling with the vessel, fog sirens, and electric light installations.

Maritime Works.—Drawings and photographs were exhibited by MM. Daydé et Pillé of Paris, of three maritime wharves and three bridges they have constructed. The railway wharf at La Boca, Panama, was built on the Pacific coast, 993 feet long and 54 feet wide, and is provided with travelling steam cranes for the unloading of vessels; the masonry foundations were laid by means of compressed air; and the works cost £140,000. The wharf erected in 8 months through a heavy surf across Kotonou bar in the Gulf of Benin, enabling the French troops to land in safety for the Dahomey campaign, is 918 feet long. The wharf at Pauillac on the Gironde, 1,824 feet long and 78 feet wide, was constructed by means of compressed air on a foundation of sloping rock overlaid with quicksand, in a current of 7 knots an hour; it is accessible by the largest vessels at any state of the tide, and carries five lines of way; and it cost £240,000. The Doumer cantilever bridge, 5,520 feet long, erected over the Red River in Tonkin in 1898–1902, at a cost of £240,000, is supported by eighteen masonry piers, founded by compressed air at a depth of 99 feet below low water. The steel swing-bridge across the Missiessy entrance at Toulon, has a span of $165\frac{3}{4}$ feet, and is worked by hydraulic machinery; and the steel Mirabeau Bridge over the Seine at Paris has a central, jointed arch, with a span of 327 feet and a rise of 18 feet, and two side half arches, a length of 570 feet, and a width of $65\frac{1}{2}$ feet. MM. Le Blanc of Paris exhibited a model of a travelling and revolving Titan for the construction of breakwaters, capable of lifting blocks of 100 tons, and photographs of one of these Titans at work, and of a large rolling bridge.

Various Public Works.—Drawings and photographs of bridges, viaducts, and metal framings and works, were shown by the Moisant-Laurent-Savey Company of Paris, and plans and drawings of various works for the embellishment of towns, by M. Redont of Rheims; whilst M. le Coeur of Paris exhibited plans of the French Pavilion, and M. Dumesnil of Paris showed

photographs of the application of ferro-concrete to a variety of structures.

GERMANY.

A remarkably fine collection of engineering models, maps, plans, drawings, photographs, and statistical diagrams, relating to inland navigation, maritime canals, dredgers and ice breakers, seaports, lighthouses, protection of coasts, water-supply, reservoir construction, hygiene, sanitation, street construction, roads, bridges, and viaducts, were displayed in the Liberal Arts Building, mostly by the Prussian Ministry of Public Works. The Imperial Board of Health of Berlin, also, organised a large hygiene exhibit, with sanitary and water-supply statistics; and several large German towns combined in a collective municipal exhibit, mainly relating to waterworks; whilst Berlin provided a special municipal exhibit.

Navigation Works.

Regulation of Rivers.—Most of the larger rivers in Germany have been regulated by dipping cross dykes and longitudinal training works, formed of fascines and of rubble stone, for improving the course of the navigable channel, for arresting the erosion of the concave banks, and for concentrating the flow, during the low stage of the river, into a central, narrowed low-water channel, so as to increase the available depth, of which works the Rhine, the Elbe, the Vistula, and the Netze furnish notable examples, as illustrated by plans and charts. The regulation of the flow of the rivers has been only recently undertaken. Works have been commenced on the River Oder, after prolonged investigations, for mitigating its floods, by retaining the water in the hilly districts by means of dams forming reservoirs, and thus storing up water for times of drought. A new outlet channel has also been formed for the Vistula, $4\frac{2}{3}$ miles long, to facilitate the discharge of floating ice and high floods. Besides drawings and plans showing this work, hydrographic surveys of the Oder, Elbe, Memel, Pregel, Vistula, Weser, and Ems, and their basins, were displayed, specially prepared to devise methods for the mitigation of the floods of these rivers, and also a model of the North German river district.

Improvements of Baltic River Outlets.—The works which have been carried out for deepening the outlets of the Oder, Nogat,

Pregel, and other German rivers flowing into the Baltic, across silty lagoons, by moles or jetties for concentrating the flow, were illustrated by a model, charts, and photographs of the Königsberg Ship-Canal, $25\frac{1}{2}$ miles long, constructed in 1890–1901 at a cost of £105,650, forming the outlet of the Pregel from Königsberg to the Baltic, affording a bottom-width of $98\frac{1}{2}$ feet and an average depth of $21\frac{1}{2}$ feet; charts of the mouth of the Vistula at Neufähr; and a plan and chart of the waterway connecting Neufahrwasser, Danzig, the Vistula, and Frisches Haff, into which the Nogat and the Pregel flow.

Canalisation of German Rivers.—The improvement of rivers for navigation in Germany by canalisation, which was commenced between 1860 and 1870 on the Saar, and subsequently carried out on the Brahe, Spree, Main, Upper Oder, Fulda, Ems, and Mosel, and now proposed for the Lower Oder, was exemplified by a plan of the River Fulda, which has been canalised along a distance of $17\frac{1}{4}$ miles between Cassel and Münden, where it joins the Werra to form the Weser, by seven moveable needle weirs, as shown by a model and photographs, with a lock along each weir for the passage of vessels.

Canal Construction in Germany.—Models of the locks on the Oder-Spree Canal at Wernsdorf and near Kersdorf were exhibited, together with photographs illustrating the construction of the latter lock; whilst charts, plans, and photographs were displayed of the Teltow Canal works near Berlin, commenced in 1901, starting from the River Dahne near its confluence with the Spree at Kopenick, and terminating at Potsdam, having a length of 23 miles, a bottom-width of $65\frac{2}{5}$ feet, and a central depth of $8\frac{1}{2}$ feet, and accommodating vessels of 600 tons, with a model of the double lock at Klein-Machnow. The Dortmund-Ems Canal, illustrated by plans, drawings, and photographs, is the largest recent inland canal constructed in Germany, and forms part of a large scheme for connecting the Rhine, the Ems, the Weser, and the Elbe by a waterway running from west to east for facilitating and cheapening the import of foreign produce, which, however, owing to agrarian opposition, has only been quite recently sanctioned as far as Hanover. The Dortmund-Ems Canal, constructed in 1890–98, is 154 miles long, with a bottom-width of 59 feet and a depth of $8\frac{1}{2}$ feet, and cost £3,750,000. It is provided with twenty-one locks, and a floating canal lift at Henrichenburg, represented by a fine model,

capable of expeditiously raising a vessel of 800 tons a height of 46 feet in a trough full of water, supported by five cylindrical vertical floats in circular wells; and it is also furnished with revolving segmental stop-gates, to shut off sections of the canal on the occurrence of an accident. The Dortmund-Rhine Canal, $28\frac{4}{5}$ miles long, prolonging the Herne branch of the Dortmund-Ems Canal to the Rhine at Ruhrort, is in progress; and the Mittelland Canal, starting from the Dortmund-Ems Canal at Bevergern, will cross the canalised Weser at Minden, and stop at Hanover instead of proceeding to the Elbe.

River Harbours.—With the increase in river traffic, river harbours have been largely developed; and in addition to supplying the requirements of commerce, they are serviceable as havens for vessels in the winter from floods and floating ice, for which purpose their entrances are placed downstream; whilst at important centres of traffic on rivers, and near river outlets, ports have been formed with basins and well-equipped quays. These works were exemplified by models, charts, and photographs of the sea-ports of Memel, Neufahrwasser-Danzig, and Emden, the coal-shipping ports of Ruhrort on the Rhine and Kosel on the Oder, the ports of Geestemünde on the Weser and Harburg on the Elbe, the timber harbours of Brahamünde and Thorn on the Vistula, and the refuge harbour of Torgau on the Elbe.

Roadway Bridges across Rivers.—Recent cantilever and lattice-girder bridges across the Oder, and bowstring-girder bridges across the Spree at Charlottenburg and the Weser at Nienburg, were illustrated by charts, sketches, and photographs.

Ice-breaking.—The method employed for breaking the ice by special steamboats on the Vistula was very clearly indicated by two models in relief; and models of various ice-breaking steamers were also exhibited, together with a cross section of the Vistula near Graudenz, and a book describing the system adopted, with illustrations, published in 1900. The steamers do not cut into the ice with their bows, but in steaming forward they mount the ice and break it down with their weight.

Traffic on Waterways.—The traffic on the various German waterways in 1875 and 1900 was shown on two maps by coloured bands along the rivers and canals, proportionate in width to the extent of the traffic, and in two colours representing respectively the incoming and outgoing trade, and with circular

bands at the principal ports, which enable the relative amount of traffic along the several routes, and the increase of traffic between the two periods to be seen at a glance. These instructive maps, which have been published, were drawn up by Geheimer Baurath Sympher, who has also prepared another diagram map showing the depths of the waterways by the width of coloured bands, differing in colour according as they represent open rivers, canalised rivers, or canals, with the dimensions of the locks, published in Berlin in 1903. A very large increase in traffic during the last quarter of the 19th century occurred on the Rhine, the Elbe, the Oder, and the waterways leading to Berlin.

Dredgers and Steam Tugs.—The bucket-ladder, grab, and suction dredgers, steam tugs, and other plant employed for the maintenance and deepening of the Rhine and Elbe, Swinemünde, Memel, Pillau, Emden, and other ports, and the Dortmund-Ems Canal, were illustrated by a series of models, charts, and photographs: and a book giving full particulars of the construction and working of these dredgers was published in Berlin in 1904. The cost of suction dredging has been so much reduced in Germany, that, under favourable conditions, it amounts to less than $1\frac{1}{2}d.$ per cubic yard; and the largest dredgers can raise several thousand cubic yards per hour.

Maritime Works.

Protection of Dunes.—The gradual arrest of the travelling dunes on the shores of the Baltic by a network of wattling, and the retention of the sand by the cultivation of grass and certain plants, and promoting the growth of suitable shrubs and trees, was very clearly shown by models of the dunes at different stages of the works, and by maps, drawings, and photographs of the dunes; and specimens of the plants and trees grown upon the dunes were exhibited, with a book giving descriptions of the works, published in Berlin in 1900.

Lighting of Waterways and Coasts.—Two very popular and attractive models represented the illumination of two portions of the waterway leading from Swinemünde on the Baltic up to Stettin, by tiny electric flashing lights, exhibited from little towers on the model in the positions of the actual lighthouses; and a chart indicated the illumination of the Lower Ems between the North Sea and Emden. The lighthouses, also, at Swinemünde and Heligoland, and the lightship on the Borkumriff

bank off the German North Sea coast, were shown by drawings and photographs.

Various Works.

Reservoirs formed by Dams.—Numerous reservoirs have been constructed in the last four years in Germany for water-supplies to towns, for generating electricity by water-power, and also for mitigating floods, by erecting masonry dams, curved upstream in most cases, across valleys in mountainous regions. Maps showed the reservoirs thus formed in the Rhine provinces, Westphalia, Bohemia, and Silesia; and diagrams gave the discharges of the rivers in the various valleys; whilst a model of the Urft and Ruhr valleys, with a dam at Gmünd in the Eifel, and a power-station at Heimbach, together with drawings and photographs, indicated the dam and other works relating to this reservoir. Various other reservoirs also in these regions, with their dams and accompanying works, were illustrated by drawings and photographs, and described in a pamphlet, with views and diagrams, by Professor Intze.

Waterworks of German Towns.—Several German cities and towns combined in a collective exhibit of their different waterworks, as, for instance, Berlin, Cologne, Dresden, Frankfort, Barmen, Chemnitz, and Kiel; and filtration plant was shown by Leipzig and Kassel, and a scheme of double filtration by Mr. Goetze of Bremen in a model.

Sanitary Statistics.—In a very comprehensive hygiene exhibition by the Imperial Board of Health in Berlin, there was a statistical map, and a synoptical collection of diagrams, intimately connected with sanitary engineering. The map, issued in Berlin in 1904, shows by a series of special signs, for every German town of 15,000 inhabitants and over, the size of the town in three categories, the sources of the water-supply, and the average volume delivered per head per day, the sewage system in use, the average birth-rate and death-rate for 1892–97 per thousand inhabitants, and indicates the main and branch lines of railway by thick and thin red lines respectively. The sheet of coloured synoptic diagrams, also issued in 1904, represents the growth of the population of the German Empire between 1816, 1855, and 1900, the distribution of the population according to their ages in large towns, middle-sized towns, and small communities, statistics as to births, deaths, mortality from different causes and at different ages in

certain periods, and other particulars relating to health in different years.

Municipal Works.—Berlin supplied a special exhibit of its streets and bridges, and Charlottenburg of its gas-works and system of lighting; whilst the mono-rail, overhead, suspended, electric railway, running for $6\frac{1}{2}$ miles of its course of $8\frac{1}{4}$ miles, over the River Wupper, through the centre of the long, crowded, industrial towns of Elberfeld and Barmen, forming a novel method of communication, without impeding at all the traffic in the narrow thoroughfares, was shown by photographs and drawings, which also represented proposed extensions of the system in other places.

Transportation Facilities.—A model of a track triangle, exhibited by Messrs. Siemens and Halske, showed the various arrangements by which different converging Berlin railways are enabled, by means of lines with varying gradients, to cross over and under one another in safety; and a model of the new fire-proof wharf erected by the North German Lloyd Company of Bremen at Hoboken, New Jersey, represented the facilities provided for the transatlantic steamers of this line in New York Harbour.

AUSTRIA.

A very interesting exhibit of waterways and railways was shown in the Austrian Pavilion by the Austrian Ministries of Commerce and of Railways, indicating the improvements carried out, in progress, and proposed in inland navigation, and the railways in mountainous districts in Austria.

Waterways.

Danube Regulation Works.—A map of the Danube from Korneuburg to Fischamend, showed the regulation works which have been carried out on the Danube near Vienna, mainly along two lengths of the river of $4\frac{1}{8}$ miles and $1\frac{3}{5}$ miles; the river harbours constructed and proposed; and the Danube Canal, an old minor branch of the Danube which passes along the outskirts of Vienna, and has been converted into a harbour. A large model showed the weir with overhead bridge, completed in 1902, near the upper end of the Danube Canal, which is closed by a series of iron shutters sliding between suspended frames which are hinged to the underside of the bridge, and can be raised to a horizontal position under the bridge, to afford the

requisite headway, when the weir is open, for the vessels to pass along the canal. The weir has been built to shut off the floods of the Danube and floating ice from the canal; the bridge provides a roadway to the land between the canal and the Danube; and the lock in the neck of land near the bridge furnishes an access for vessels between the canal and the Danube when the weir is closed.

Moldau and Elbe Canalisation.—These works, illustrated by models, plans, drawings, and photographs, have been designed to secure a navigable waterway, with a minimum depth of 7 feet, for barges of about 650 tons between Prague on the Moldau and Aussig, a flourishing coal-shipping port on the Elbe not far from the German frontier. The canalisation of the Moldau from Prague to its confluence with the Elbe at Menlik, a distance of $29\frac{1}{3}$ miles with a fall of $82\frac{1}{2}$ feet, by five weirs and locks, is very nearly completed; but only two of the six weirs and locks have been commenced for canalising the Elbe between Menlik and Aussig, a distance of $43\frac{1}{2}$ miles, with a fall of $70\frac{1}{3}$ feet. There are two locks alongside each weir, one for single vessels, 256 feet long and 36 feet wide, and the second for a train of barges, 738 feet long, and widened out in the lock-chamber to $65\frac{2}{3}$ feet. The chief interest of the works on the Moldau consists in the varied types of weirs introduced, the peculiar forms of sluice-gates employed for closing the sluice-ways in the locks, and the large fall of the lowest lock at Horin, close to the Elbe, of $29\frac{1}{3}$ feet, to surmount the difference between the level of the Moldau, at the place where a lateral canal, $6\frac{1}{3}$ miles long, branches off to join the Elbe (owing to the difficulties presented by floods in the lower part of the Moldau), and the level of the Elbe at the outlet of the canal below the confluence of the Moldau. The two upper weirs are ordinary frame weirs, closed by needles (or long square spars), but with different systems for the release of the needles; the next frame weir is closed by shutters sliding on rollers; and the fourth weir has an overhead bridge with suspended frames, down which shutters slide for closing the weir, as at the Nussdorf weir at the head of the Danube Canal. In addition to vertical sluice-gates sliding on rollers at the locks, horizontal, rolling sluice-gates have been adopted, and revolving segmental sluice-gates at the lower end of the Horin lock. Timber passes, $39\frac{1}{3}$ feet wide, have been provided at the

further end of the weirs from the locks, with moveable timber bottoms to regulate the passage of long rafts of timber down them; and they can be closed by segmental gates. Aussig harbour with 5 miles of quays, its railway station, and the sidings with a total length of 47 miles for its traffic, were illustrated by plans and photographs.

Proposed Waterways.—A map showed the canals for connecting the Moldau, Danube, Oder, Elbe, Vistula, and Dniester, and the extension of canalisation on the Elbe, contemplated in an Act passed in 1901, comprising a length of over 930 miles of waterways, surmounting differences of level of about 5,250 feet, involving an estimated cost of £41,700,000. The Danube-Oder Canal, presenting the least difficulties in construction, is to be undertaken first; it rises 407 feet, and falls $252\frac{2}{3}$ feet, in surmounting the water-parting between the two river basins in its length of $165\frac{1}{4}$ miles; and a scheme for a canal with locks only, and another with inclined planes and locks, have been prepared, as shown by longitudinal sections.

Railways in Mountainous Districts.

Very effective dioramas were exhibited of the most interesting portions of the Semmering, Arlberg, Brenner, and Tauern railways; and models showed the method of constructing the Austrian Alpine tunnels, a wooden caisson with the Redlich system of scaffolding rising with the work, and the centering used in constructing the high masonry arch of 260 feet span over the river Isonzo. Numerous plans, also, and photographs illustrated the arrangements and special features of interest of these railways.

BELGIUM.

The exhibits from Belgium had to be displayed in a very limited space in the Belgian Pavilion, and consisted almost wholly of plans, drawings, and photographs.

Waterways.—The Department of Public Works showed photographs, plans, and statistics relating to canals and river improvements in Belgium. The Society for improving the access of Brussels to the sea by water, illustrated by plans and drawings the works for forming a port at Brussels, the enlargement of the canal from Brussels to the Rupel, and the service of traction provided on this canal, and on the Scheldt and its tributaries. MM. Coiseau et Cousin furnished maps and notices of

the breakwater they are carrying out at Zebrugge in the North Sea, for protecting the entrance to the Bruges Ship-Canal, and for forming also a port of call for steamers; and a small model indicated the huge steel caissons, which are lined with concrete, floated into position, sunk and filled up with concrete, so as to form the foundation blocks, 3,000 tons in weight, of the breakwater, from the bottom up to a little above low water.

A novel plan of protecting the banks of rivers and canals from the wash of passing steamers, and from drifting ice, and sea slopes from erosion by waves, by a layer or apron, formed of a series of panels of burnt clay or cement concrete, four inches thick, pierced by galvanised wires, down which they are readily slid under water, was exhibited by MM. Fichet; and the system has been successfully applied on the Scheldt, the Bruges-Ostend Canal, the Po, and several other canals and rivers, at a cost not exceeding 6s. 4d. per square yard.

Direction of Sanitary Works.—A special department in the Ministry of Agriculture superintends all matters relating to public health and hygiene in Belgium, and exhibited maps and documents dealing with these subjects. In respect of engineering, bacteriological analyses are made of water-supplies; and the department examines proposals and aids works for water-supply in rural districts, and controls the disposal of sewage and waste products, and subsidises approved sewerage schemes.

Foreign and Colonial Railways.—Maps were displayed of the Pekin-Hankow railways in China, proposed to be carried out by a Brussels Company, and also of the Congo Railway, which has been partially completed by another Brussels Company.

DENMARK.

The exhibits from Denmark comprised a model of a steam ferry-boat for conveying railway carriages between Korsøer and Nyborg for the Danish State Railways, and the jetties of access; a large model of the Free Port of Copenhagen, with its protecting breakwater, basins, quays, and jetties; and, lastly, a large model of the "Hellig Olav," one of the steamers of the Copenhagen United Steamship Company.

EGYPT.

A reference to the models of irrigation works exhibited by the Egyptian Government will be found at the end of the

description of "Indian and Egyptian Irrigation Works," on page 130 in the "Report on the Exhibit of Civil Engineering."

CEYLON.

A description of the works carried out and in progress at Colombo Harbour, of which a model was exhibited by the Ceylon Government, is given amongst the descriptions of "British Maritime Engineering Exhibits," under the heading of "British and Colonial Harbours," on page 124 in the "Report on the Exhibit of Civil Engineering."

MEXICO.

Hydrographical surveys and photographs of harbour works were exhibited by the Secretariat of Communications and Public Works of Mexico. Drawings of the City of Mexico drainage works, with a report, photographs showing public works in the City of Mexico, of the water-power works on the Atoyac River, and of the Manzanillo harbour works in progress, and a set of drawings of the water-supply and sewerage works of Tampico, were also displayed.

BRAZIL.

These exhibits comprised photographs of the waterworks of San Paulo, of public works and river improvements in the Amazon State, and of Manaos Harbour, a hydrographical relief map of the State of Rio Grande do Sul, plans, sections, and drawings of the San Francisco Railway, and plans and maps of Rio de Janeiro.

ARGENTINE REPUBLIC.

The Ministry of Public Works at Buenos Ayres exhibited relief models of the Plata and Parana rivers opposite Rosario de Santa Fe, and of the Port of Concepcion del Uruguay, hydrographical surveys, maps, and photographs of the rivers Parana, Uruguay, and Plata, and the works on them, the ports of Buenos Ayres, Rosario de Santa Fe, Concordia, and other river ports, and the Military Port of Bahia Blanca. The Department of Public Works of the Province of Tucuman exhibited a plan of a reservoir designed to store up 261,600,000 cubic yards of water for the irrigation of the province, at a cost of about £200,000; whilst a model on a large scale showed the Cadillal masonry dam enclosing the reservoir, with the intake

and waste weir. A plan and a description of the port of Buenos Ayres, with particulars about its maintenance, and statistics regarding its trade, were shown in the Argentine Pavilion, and also plans of the city and samples of its wood-paving.

CHINA.

Some curious charts of the Yellow River, and charts and maps of Chinese sea and river ports, together with a map illustrating the lighting of the coasts of China, were exhibited in the China Section of Liberal Arts. Models of Chinese bridges and primitive dredging boats were also shown.

GENERAL REMARKS.

In taking a general glance of the comprehensive engineering exhibits displayed at the St. Louis Exhibition, it must be acknowledged that models afford the most satisfactory form of exhibit, as being at the same time the most readily intelligible and attractive, especially if supplemented by plans, drawings, and photographs. In this respect, the Government of the United States, with certain other American exhibitors, and the Government of Germany, stood out most conspicuously; the British Exhibitors were very prominent with models relating to maritime, dock, and tidal river engineering; the Austrian Government with reference to river works and railways; the Egyptian Government concerning irrigation; and the French exhibitors in the illumination of coasts; whilst two or three interesting models were exhibited by Denmark and the Argentine Republic.

The Civil Engineering Exhibits of the United States, whilst naturally the largest, were most complete in respect of river works, river bridges, lighthouses and lenses, the Croton water-supply and the Salt River irrigation works, the St. Mary's Falls Canal and the Chicago Drainage Canal, the extension works of the Pennsylvania Railway from New Jersey to Long Island, the new terminal stations at Washington and New York, and the New York Subway. The principal British exhibits related to lighthouse and lightship models, tidal river improvement, dock works, harbour works, dredgers, irrigation works, and municipal works, including the Birmingham water-supply, and Manchester sewage disposal. The chief French exhibits comprised lighthouse apparatus for flashing lights, bridges over rivers, maritime wharves, the Paris water-supply,

drainage, and paving, and its Metropolitan Railway. The most conspicuous features of the German exhibits consisted of river improvement works and their harbours, canal works, dredging works, protection of dunes, waterworks, and statistics. The Austrian exhibits were wholly concerned with river regulation and canalisation, projected canal works, and railways in mountainous districts. The exhibits of the United States were obtained by a combination of Government organisation with municipal and railway enterprise; those of Germany, and within special limits those of Austria, were almost wholly collected by Government Departments, with the aid of public funds; whereas those of Great Britain, and in a considerable measure those of France, were nearly entirely due to municipal and commercial enterprise; but they all, in their different ways, worthily represented the countries from which they originated.

The conclusions that may be drawn from these exhibits are: the value of models for illustrating engineering works; the importance of statistics, drawn up as far as practicable in the form of diagrams, for indicating the progress of sanitation and the increase of traffic; and the great advantages, for promoting cheap means of communication and advancing the trade of a country, of placing its available inland waterways under public control, so that they be utilised, improved, and extended if expedient, for the benefit of the nation as a whole, according to the system followed in North America, Germany, and Austria.

L. F. VERNON-HARCOURT.

REPORT BY F. LITCHFIELD, Esq.,

BRITISH JUROR FOR DECORATION AND FIXED FURNITURE AND
HOUSEHOLD FURNITURE.

I propose to limit my remarks to British, American, French, and German exhibits. Those of other countries do not appear to me to need any special notice.

BRITISH SECTION.

The British exhibits under Groups 37 and 38 were excellent of their kind, but quite inadequate in point of number to represent the important industries which are carried on by numerous firms of high standing and reputation in the United Kingdom.

Only six British firms competed, Mellier & Company, George Trollope & Sons, Waring & Gillow, Harehope Mining & Quarrying Company, under Group 37, and William Birch, Ltd., and F. P. Bhungara & Company, under Group 38. Of these Waring & Gillow's "country house" was the most important, all the different rooms being furnished and decorated with reproductions of eighteenth-century designs. George Trollope & Sons' series of rooms were respectively Elizabethan, Queen Anne, Georgian and Robert Adam in style. A notable feature in Trollope & Sons' exhibit was that some few specimens of genuine old furniture of the period represented were included, and the pieces associated with these were made to harmonise with them.

Mellier & Co.'s exhibit was French in character and comprised some excellent reproductions of old Louis Seize cabinet work with mountings in gilt bronze.

William Birch, Ltd., exhibited furniture made from eighteenth-century designs such as Chippendale, Heppelwhite, Sheraton and contemporary makers.

AMERICAN SECTION.

American exhibits under Groups 37 and 38 were of two kinds, those made by hand and others chiefly produced by machinery.

An important exhibition by Baumgarten of New York showed exact imitations of luxurious French furniture of the Louis XV. and XVI. periods, and a few other firms displayed copies more or less faithful of English XVIIIth century designs, and specially arranged rooms where the furniture was of a very simple character adapted for houses of an ordinary description. These exhibits, from the more ambitious reproductions by Baumgarten to the simple equipment shown by firms producing homely furniture, were the product of hand labour.

By far the most important exhibits were, however, those of a group of large manufacturers in the district of the Grand Rapids, Michigan, and these were made by machinery and finished by hand. The designs were chiefly reproductions of what is called in America "The Old Colonial Furniture," in oak and mahogany, chiefly the latter material—a style similar to that which we recognise as "First Empire" or its English equivalent, severe, rather clumsy and lacking the fine mountings which in the case of the French prototypes relieve the mahogany. Copies of Dutch marqueterie were also included. Some of the mahogany veneers used by these firms were extremely rich in figure and markings, but the furniture itself would not achieve much distinction if shown in England in competition with the work of our second-rate firms.

With this class of machine-made furniture one must include the numerous exhibits of office fittings, roll top desks, which are well known in England, and many excellent arrangements for storing and classifying papers and documents. The fittings of shops, such as grocers' stores, billiard saloons, barbers' shops, with numerous labour-saving appliances, appear to be ingenious, neat, and admirably adapted to their several purposes. These met with due appreciation and were without serious competition from other nations.

FOREIGN SECTIONS.

France.

The French exhibits were good reproductions of the styles which are classic in France—Louis XIV., XV., XVI., the furniture in many cases being exact copies of well known historical specimens in the Musée du Garde Meuble and the Louvre. The work of a French manufacturer named Linke displayed more originality than the others, but his designs were

founded on those of the time of Louis XV., only carried out with more ambitious ornament in chased and gilt metal than one finds in the richest specimens of the period. A great many of these French exhibits had been shown at the Paris Exhibition of 1900. The cost of French furniture is considerably affected by the quality of the metal mounts which form so important an element in its decorative effects. This kind of work is carried out in Paris much better and cheaper than anywhere else. The costly patterns and moulds from which brass mounts are cast, are to be obtained much more readily in Paris than elsewhere, and the dexterity of the French workman in chasing and gilding metal work is well known—therefore the reproduction of furniture of the classic periods of French taste has no formidable competition by other countries.

Germany.

The exhibits by German designers and manufacturers were by far the most important of this department of the Exhibition, in number, in originality, enterprise, and expenditure of capital, and it was evident that a great effort had been made to impress the world with the resources and industry of this progressive nation. Within the last twenty or twenty-five years an art movement known as the "Modern" has been steadily on the increase in Germany. It appears to be somewhat upon similar lines to the aesthetic departure in the furnishing and equipment of dwelling-houses, which, under the teachings of William Morris, Ford Madox Brown, Rossetti and others, obtained so great a following in England some thirty years ago, and which had for its object the "Making of the House beautiful" by considering the design and colouring of furniture and decoration as a general scheme, rather than as a grouping of independent items.

In Germany, particularly in Munich, but also in Berlin, Dresden, Darmstadt and other art centres, the old idea of reproducing the earlier styles has been to a great extent superseded by the desire to design furniture not only original, but especially adapted to its intended use.

In Group 37 there were no less than between 35 and 40 rooms such as "The Grey Sitting Room"; "Tea Room"; "Dining Room"; "Music Room"; "Library"; "Gentleman's Room"; "Hall of an Art Connoisseur"; "Nursery with small

Night Nursery"; "Artist's Club"; "Reception Room"; "Boudoir"; "The Summer Residence of an Art Connoisseur," besides various state rooms, ante-rooms and council chambers.

These rooms were specially designed so that everything was attuned to the keynote upon which, as it were, the harmony was arranged; colour of walls, ceiling, carpets, hangings, furniture, tiles and all accessories were considered not as independent units, but as part of the whole scheme. In some cases novel and startling, in nearly all ambitious and original, these schemes of decorative furniture, although of undoubted merit, struck one as being extremely difficult to associate with the equipment of an ordinary dwelling-house, and their adoption must involve somewhat of a revolution in the occupant's ideas of furnishing.

Instead of, as in the British and other countries' exhibits, the minor accessories and ornaments being purchased from unnamed firms and placed about for the enrichment of the various rooms, in these German exhibits each accessory ornament, stained glass window, panel, terra-cotta medallion, iron or copper plaque or what-not was especially designed, and the name of the exhibitor given with the object of having some recognition by the jurors. In some exhibits more than twenty names and designers of such accessories were catalogued.

Space does not permit for more detailed reference, but enough has been said to show the importance and extent of Germany's efforts in this department of the Exhibition.

Position and Prospects of the Chief British Industries represented at the Exhibition, in Relation to Foreign Competition, and General Remarks.

With regard to this part of my report I will confine myself to classes of furniture which I had to adjudicate upon.

There was really but little competition from foreigners, with the work exhibited by British firms. Mellier & Son's reproduction of Louis XVI. cabinet work and mountings was quite equal to that of French firms. The American copies of English furniture were more crude and less satisfactory than the English work, and, as I have already remarked, the machine-made furniture shown by the Grand Rapids manufacturers did not really compete with our British exhibits, because none of

our East End firms, where machinery is largely employed, were competing.

As regards price, it seems to me from the inquiries I made, that, generally speaking, the English manufacturer of good class furniture can successfully compete with the American makers, even after paying the high duties levied by the United States Customs.

The Small Number of British Firms Competing.—In the first portion of this report I have remarked upon the very poor representation in point of number which our British Section put forward, and I understand that the chief exhibitors in my department were only induced to take part in the exhibition by some persuasion and encouragement on the part of the Royal Commission. This seems to require some remedy. In England we are, I think, somewhat weary of these oft-recurring international exhibitions, where the return is generally not sufficiently lucrative to justify the trouble and expense incurred.

I have been informed that the same want of enthusiasm is found among French manufacturers, and that the participation in this St. Louis Exhibition was encouraged by the hope on the part of some of the French manufacturers that a reward by their own government in the shape of a membership of the Legion of Honour was the chief inducement to exhibit.

I do not know whether my report should include a suggestion of the kind, but it certainly has occurred to me that an impetus would be given in the direction of more numerous British firms exhibiting, if the government were able to give some honour or decoration of a similar character to the French Legion of Honour. I do not think that at present any such distinction or award is available in Great Britain.

Work of the Jurors.—Owing to the small number of British exhibitors, their representation on the different juries was proportionately weak, and great tact and patience were required to secure adequate results for our countrymen. Out of a Jury of thirty-two members I was the only Englishman, and a large number of American and German jurors, who could at first see but little value in the reproduction of old designs, made the position a difficult one.

The German jurors were enthusiastic for their modern art movement, and the Americans seemed to be more impressed by the number of hands the different firms employed than by the

excellence of their work. A curious idea too was prevalent in the minds of several of my American colleagues, that a firm should not make any special effort for exhibition, but should show that which was produced in the ordinary way of "his line," as they expressed it, and that to show any work which was not the ordinary output of the factory was an attempt to secure an unfair advantage. This view was impressed upon me by at least three of the American jurors connected with the "Grand Rapids" district, who were editors of newspapers connected with the Furniture trades.

In the first place they refused to recognise the excellence of any reproductions of the earlier styles, and on the first day of our work for the French exhibits, which were to be adjudged, only one grand prize was suggested by the majority of the jurors. Some serious consultations with my German and Japanese colleagues, who were, with myself, acting as vice-presidents, and with Mr. J. B. Tiffany, our president, resulted in our ultimately obtaining a more generous recognition, and in the result awards were made more in accordance with those given at the Paris Exhibition.

The rather lavish way in which grand prizes had been given at the last Paris Exhibition also made our work a little difficult, as the Frenchmen would only be satisfied with similar awards to those given at their own exhibition.

I think that the question of making awards to collaborators requires some further consideration. In many cases firms put forward eight or ten names of collaborators, and in others none. As matters stand at present, it seems that any person for whom the firm desires to obtain an award, may be put forward as a collaborator without sufficient proof that he has been really instrumental in obtaining the result.

Our Jury examined about 600 exhibits and made nearly 600 awards, including medals to collaborators.

FREDERICK LITCHFIELD.

REPORT BY GILBERT R. REDGRAVE, Esq.,

BRITISH JUROR FOR CERAMICS.

The display of porcelain and pottery included in Group 45 at the St. Louis Exposition was not, on the whole, a very representative one, and the participation by American manufacturers, especially in the class of table ware, was relatively small. The finest collection contributed by any one country was that brought together from Japan; France and Germany sent some magnificent examples of porcelain from the national manufactories at Sèvres and Berlin; Germany, Austria and Hungary, Holland and Denmark were fairly well represented, and the ceramic productions from this country were extremely well selected and gave an excellent picture of the present state of the art in Great Britain.

The members of the International Jury were placed at some disadvantage in beginning their work, in consequence of the absence of catalogues. No general catalogues were available, except for the British Section, until the examination of the different countries was about half completed.

The arrangement of the various departments of the exhibition, though it was admirable in theory, did not prove in practice to be workable, and the ceramic productions were to be found in many different buildings, spread over a very wide area. Certain countries had placed many of the best specimens of their ceramic wares in the Art Galleries, and some of the British pottery was shown in the section for "Arts and Crafts." All these objects were not submitted to the jury for "Ceramics," but were brought before the jury for "Fine Arts" and judged separately. In some cases the pottery was displayed in the special pavilions erected by the respective countries—thus the entire collection from Sèvres was placed in the French Pavilion, and many fine specimens of Austrian pottery were shown in the Austrian Pavilion.

BRITISH SECTION.

The examples of pottery and porcelain contributed by Great Britain comprised the work of about twenty representative

firms. The ceramic court was well arranged with a series of glass cases of uniform design. Specimens of porcelain, semi-porcelain, earthenware and pottery were shown by the leading manufacturers, and there was a good display of wall tiles and enamelled terra-cotta. The Exhibition contained, however, but few illustrations of apparatus and pottery appliances. Prominent among the British exhibitors were Messrs. Minton, Ltd., of Stoke-upon-Trent, and Messrs. Doulton & Company, Ltd., of London, while the "Ruskin Ware" of Mr. W. Howson Taylor of Birmingham attracted much attention. Independent displays, not included in the Ceramic court, were made by Messrs. Doulton & Company, Ltd., and by Sir E. H. Elton, Bart.

AMERICAN SECTION.

The exhibition of American pottery was chiefly remarkable for the excellence of the colouring and the glazes in the case of the wares shown by the Rookwood Pottery Company of Cincinnati, and work of a similar type was contributed by the American Terra-Cotta & Ceramic Company and the Van Briggles Pottery Company. The Grueby Faience Company had some good examples of enamelled terra-cotta for structural purposes, including duplicates of the decorations for the New York Subway stations. Well-executed terra-cotta work and vitrified structural decorations were shown by the Winkle Terra-Cotta Company and the Laclede Fire-brick Manufacturing Company. The American section likewise contained a large display of hand-painted pottery and porcelain, in many cases the work of amateurs and lady artists. These specimens were collectively shown by the Missouri State Commission and the Indiana State Commission. The extensive American potteries at Trenton and East Liverpool were very poorly represented, though the Trenton Potteries Company had a fine collection of sanitary-ware, baths, etc.

FOREIGN SECTIONS.

Austria.

The Austrian ceramic court contained a choice collection of the most recent work of many of the chief manufacturers, and the Austrian Government, in their exhibition of school work, showed numerous examples of ceramics from the Schools of Applied Arts in Vienna, Prague, Teplitz-Schönau and Bechyn. Many of these schools work in connection with the local

manufactories, upon which they, no doubt, exert a useful and wholesome influence. Certain important firms in Vienna are not actually manufacturers of porcelain, but are simply engaged in the decoration of wares purchased in the white from other factories. The Jury were, in some cases, in doubt as to whether such works were entitled to high awards. Some difficulties arose, also, in connection with the question whether terra-cotta and pottery, decorated with colouring matter which had not actually passed through the kilns, were eligible for medals and prizes. The attractive and able work of F. Goldscheider of Vienna, comes into this category, as many of his figures and groups were "lacquered," or coated with colouring matter, which could be removed with the point of a knife. A fine display of original work in porcelain was shown by Messrs. Riessner, Stellmacher & Kessel of Teplitz, and several manufacturers contributed specimens of porcelain decorated in the Vienna taste.

France.

French ceramics were worthily represented by the magnificent display of porcelain from Sèvres, and fine examples of the work of Limoges were contributed by Messrs. Haviland and Ahrenfeldt, while M. Naudet's artistic productions in biscuit porcelain deserved special notice, as did also the architectural decorations of M. Loebnitz. Tiles were shown by M. R. Sachot and by the Société des Produits Céramiques of Boulogne.

Denmark.

The Royal Copenhagen Porcelain Works sent a splendid collection of hard porcelain and many beautiful examples of under- and over-glaze colouring. Great success has recently been achieved in the employment of crystallised effects in the glaze, and the decoration shows much novelty and originality. Messrs. Ipsens, in addition to fine terra-cotta work, showed some rich and effective glazes.

Germany.

The German ceramic court presented the only example of the employment of faience decorations upon an extensive scale, surrounded as it was with glazed terra-cotta. The Royal Porcelain Manufactory of Berlin contributed a splendid series of works, including many richly painted vases and plaques and some beautiful bas-reliefs on the walls of their court. The German display was chiefly noticeable for the quaint forms and

original colouring of the wares shown by Professors Laeuger, Kornhas and others. Certain of the schools in Karlsruhe, Stuttgart and Magdeburg sent collections of art pottery, admirable in design, and in which richly coloured glazes were employed with good effect. Numerous complete rooms were fitted up in the German section, and in certain cases glazed wall tiles and objects in enamelled terra-cotta, fountains, etc., were effectively introduced. It may be stated generally that the display of ceramics from Germany contained more features of novelty and quaintness in form and decoration than those shown by any other European country.

Italy.

The examples of the ceramic manufactures of Italy included some good specimens of modern majolica, some excellent reproductions of old work and many fine designs in terra-cotta. The pottery shown by the Signa Manufacturing Company of Florence, by Messrs. Salvini and Company, and by Signor D'Amato of Naples merit special notice.

Netherlands.

The Netherlands section contained a fine display of blue and white ware from the great works of Delft, which are still in active operation and which, in addition to specimens in the earlier taste, produce many wares with coloured glazes and some fine examples of tile painting. Very thin vessels in porcelain, which exhibited great ingenuity in potting, were shown by the Rozenburg National Manufactory—the style of decoration adopted for this ware is characteristic and peculiar.

Hungary.

Some very beautiful examples of richly glazed pottery and porcelain were contributed to the Hungarian section by Miklos Zsolnay of Pesth, and Messrs. Fischer and Nagy deserve special mention for their display.

Portugal.

Highly glazed earthenware and majolica were shown by two manufacturers from Portugal, and some of the specimens displayed much technical skill.

Sweden.

There were also two exhibitors from Sweden of porcelain, pottery and faience of excellent quality and good design.

Belgium.

The ceramics shown by Belgian exhibitors were not very representative in character, though Messrs. Boch Brothers of La Louvière contributed some fine specimens and the wall tiles of Vermeiren Coche were of very high quality.

China.

In the Chinese court, in addition to many rare examples of ancient pottery and porcelain, some extremely good copies of old work were displayed by the Tea and Porcelain Company of Shanghai. The Imperial Chinese Government sent a collective display of modern ceramics, and provincial exhibits were sent from Hupeh and Kiangnan. Messrs. Deacon and Company, Tak Loong and other firms contributed excellent specimens of porcelain and pottery.

Japan.

As previously stated, the most extensive and varied illustration of the ceramic arts was that made by Japanese exhibitors, who exceeded two hundred in number. Almost every description of porcelain and earthenware was here shown, both of the finer and coarser kinds, and in richness of painting and beauty of decoration much of the workmanship was unrivalled.

GENERAL REMARKS.

In the absence of a British representative in Groups 46 and 47, I took some share in the deliberations of the Jury for these sections, but as I was not able to devote much time to the consideration of the objects, I cannot report on them with advantage.

My general conclusions upon the ceramic displays at the St. Louis Exposition lead me to believe that more novelty and originality are to be found in the works of foreign countries than in those contributed to the British section, and that in countries where state schools making a special study of ceramic processes have been founded, as, for instance, in Germany and Austria, a great influence for good upon the manufactures, and many original features in design and workmanship, can be traced.

GILBERT R. REDGRAVE.

REPORT BY J. M. CAMPBELL, Esq.,

BRITISH JUROR FOR TEXTILES.

The first meeting of the Department Jurors took place on September 2nd, 1904, at 3 p.m. at the office of Mr. Milan H. Hulbert, Chief of the Department of Manufactures, when, after a formal reception of the International Jurors appointed to groups 50, 51, 52, 54, 55 and 56, designated as Jury 7, the following were nominated as officers:—

Mr. Robt. McK. Jones, President of Jury 7,	}	United States.
representing		
Mr. J. M. Campbell, Vice-President, Group 50,	}	Great Britain.
representing		
Mr. H. M. Dix		United States.
Mr. Jas. A. McMeekin		" "
Mr. P. J. Byrne		" "
Mr. J. H. Ledyard		" "
Mr. Grenville M. Black		" "
Mr. Thos. J. Hoyt, Vice-President, Group 52		" "
Mr. Jas. R. McColl, ,, ,, ,, 51		" "
Mr. Herbert E. Walmsley, Vice-President, Group 54		" "
Mr. E. W. France		" "
Madame Jacobson		Brazil.
M. Perrin		France.
M. Paul Masse		"
M. F. Bonnier		"
M. Etienne Mascre, Vice-President, Group 55		"
M. Jacques Van ExToelen		Belgium.
M. Pierre Mali, Vice-President, Group 56		"
M. Yong Lin Fong		China.
M. K. Miyamatz		Japan.
M. J. Nishimura		"
M. J. M. Nuncio		Mexico.
Mr. J. E. Frank		United States.

The last-named gentleman being appointed Secretary.

The next procedure was to meet upon the morning of the 3rd September to form smaller Committees, and commence work upon the groups allotted, but this was impossible immediately, as the American Official Catalogue was not complete. In the meanwhile we took an opportunity of making a

tour of inspection through the Department of Manufactures, containing the most important exhibits of textiles. I at once recognised the very limited number of exhibits in these Groups from Great Britain.

Group 50.

BRITISH SECTION.

The important exhibit of Messrs. Platt Brothers and Company Limited, of Oldham, represented a perfectly equipped plant of Machinery in full working order, showing every process for Spinning, Ginning, Opening, Scutching, Carding and Combing Cotton. The Machinery was driven by Electric Motors supplied by the Westinghouse Electric and Manufacturing Co., Pittsburg. Messrs. Platt Brothers and Co. manufacture machinery in great variety suited to Wool, Worsted, Silkwaste, Asbestos, etc., also Doubling Machinery and Looms made upon both the British and French Systems. During the hours of working the Machinery was a great attraction, and was evidently watched with great interest.

There were well-arranged cases of Bobbins and Shuttles, showing the latest improvements, exhibited by Messrs. Wilson and Co., Ltd., of Barnsley, and also by the Wilson Brothers Bobbin Co., Garston, Liverpool. These cases contained bobbins for winding, warping, spinning and doubling Cotton, Wool, Silk and other textile fibres: shuttles made from boxwood, cornel wood and persimmon wood for weaving all kinds of textile fabrics.

Interesting additions to this exhibit were the specimens of lump charcoal, flake charcoal for insulating purposes, solvent and miscible naphtha, iron liquor, acetic acid, acetate of lime, etc., all of which are produced by this firm in their carbonising department, erected for the distillation of waste wood, etc., and thus producing these very valuable by-products, the economy of which is an important adjunct in most manufacturing undertakings.

FOREIGN SECTIONS.

The only exhibit of France in this group was a working machine for making fishing nets, shown by Charles Zang of Paris, which was neatly made, and capable of producing netting in any length with great speed and at a small cost.

The collective exhibits of Belgium were illustrated by Photographs and Drawings of machinery for spooling and

twisting, spinning, carding and scouring. The Jury were at first of opinion that no award should be made upon an exhibit in such a form, but, upon further information being obtained that the manufacturers had applied for space to show working machinery, but had not been able to obtain it, a Grand Prize was awarded to the exhibits collectively.

The only contribution from China was an exhibit of a model for ropemaking; and from Siam, six somewhat crude models of hand-spinning and processes for preparing cotton. These exhibits were sufficiently interesting as showing the methods employed in these countries.

GENERAL REMARKS.

Points worthy of note in this group were the very small number of the exhibits and the absence of any Exhibitors from the United States of America, as also from other countries noted for their preparation of products for textile spinning. The exhibit of Messrs. Platt Brothers & Co., Ltd. was examined with much interest by those Jurors having a practical knowledge of textile machinery construction, and the very highest compliments were passed upon it by Jurors representing the spinning mills of the Vosges in France, and the New England Mills of the United States.

Group 51.

In this group there were no British Exhibits, and among those of other countries, there were no looms or machines of any special note, or that call for particular reference, as the few working looms were only producing small articles, such as Silk Handkerchiefs, and other fancy goods by the Jacquard process. The exhibit of the Benj. Eastwood Co., of Paterson, New Jersey, a working Jacquard Silk loom, caused considerable attraction, and they appeared to be disposing of the Souvenir Handkerchiefs with great rapidity, thus giving a practical illustration of the fact that where machinery can be shown at work, the public are interested to a much greater degree than by the results alone. The Blees Moore Instrument Co., of St. Louis, had a working loom for elastic webbing for surgical purposes, and this loom, I noticed, was of British manufacture. The Textile Machine Works of Reading, Pennsylvania, exhibited a working loom for Silk Braid and Boot Lace plaiting.

The foregoing were shown in the Palace of Manufactures.

In the Machinery Department, France was represented by one machine for finishing textile fabrics, the exhibit of M. Fernand Dehaitre, of Paris, and a machine for teasing textiles exhibited by MM. Groiselin, Père et Fils of Sedan. A working Jacquard Ribbon loom was producing woven pictures, which were being sold immediately. This was exhibited by M. G. Pinatel, Ainé, St. Etienne, Loire. Electricity was the motive power.

Belgium, as in the previous group, exhibited albums containing Photographs, plans and drawings of hand and power looms, used in the textile industries.

China showed a model loom for the weaving of brocaded fabrics, of sufficient interest for Museum purposes; and from Japan there was one exhibit of Heddles, made in compressed paper, replacing those hitherto made in Bamboo, and used in native looms.

Siam's exhibits of model weaving appliances were very crude, and only interesting as showing the native methods of weaving coarse fabrics.

GENERAL REMARKS.

I cannot claim for the foregoing group either variety or even a fair representation of the numerous forms of looms used in weaving, and, whereas, in the Paris Exhibition of 1900, this group was well represented, nothing at St. Louis calls for observation, and no new feature whatever can be recorded.

Group 52.

FOREIGN SECTIONS.

The exhibits from France proved the thorough knowledge, diversity of taste, and skill employed in the numerous classes allotted to this group.

In the bleaching class specimens of the various processes used in all kinds of textile yarns were carefully arranged. The beautiful range of colourings shaded with good effect demonstrated the important advance chemistry has made, in producing the delicate tints for which France continues to take the lead.

The printed fabrics were not as numerous as might have been looked for. The great printing works of Alsace which now come under the German section had no exhibitors.

Belgian apparatus and machinery used in the foregoing

processes, although an important industry in this country, so far as dyeing and bleaching is concerned, were only shown by photographs. This was rather surprising, Belgium having over two hundred dyeing, and over one hundred bleaching establishments distributed throughout the provinces of Brabant, Namour, Antwerp, Hainaut, and Liège, and yet only five manufacturers were represented.

The five exhibits of the United States, particularly that of laundry machinery, would have been more appropriately shown under a group closely allied to Domestic Economy.

The single exhibit of Japan of dyed fabrics, and a small exhibit by the Imperial Chinese Government of a model showing the process of glazing, bleaching, and dyeing, were of no commercial interest. There was also a small exhibit of cotton yarns from Mexico.

BRITISH SECTION.

In this section 3 Gold Medals were awarded to British Exhibitors: Messrs. Danl. Lee and Co. for printing upon Textile Fabrics, and Messrs. Wm. Liddell and Co. and Messrs. John S. Brown and Sons for finishing of Damask Linens.

Group 54.

This important branch of industry was far better represented than any other department of the textile groups, but here again Great Britain was notably in the background.

The 25 exhibits of the United States demonstrate the great advance made in all classes of cotton weaving. The cases were attractively arranged, and the printed cottons of the Aberfoyle Manufacturing Co., The Amory Manufacturing Co., of New Hampshire; The Amoskeag Manufacturing Co., of New Hampshire; The Eddystone Manufacturing Co., of Eddystone, Pennsylvania; J. L. Stipel and Sons, of Wheeling, West Virginia, will favourably compare with the output of our Lancashire Mills. Every description of Percales, lawns, satines, lace curtains, bedspreads, jacquard weaves, etc., was fully represented, and there is every indication that the American Mills are determined to increase their output, using every modern machinery to economise cost of production not only in the inferior, but in the higher grade goods.

The next section the Jurors paid their attention to was the exhibit of France, which was exceptionally complete and

interesting. The general arrangement and display of the goods made this group very attractive, and cannot fail to be of great advantage to their export trade.

I would here particularly emphasise the methods adopted by France, the Chamber of Commerce of Roubaix, and the various syndicates, together with a small number of private firms, making a joint collection of 144 Exhibitors, showing the importance of the Cotton industries of France, and the desire to retain her large export trade in these goods to the South American, and other similar markets. The designs and colourings were of an up-to-date character, and well suited to an export trade.

The only two exhibits in this group from Great Britain were that of Messrs. Danl. Lee and Co., of Manchester, and Messrs. Turnbull and Stockdale, Ltd., who made a very attractive exhibit of printed cotton fabrics, suited to furnishing purposes, and to each of whom a Gold Medal was awarded.

Passing on to the Cotton fabrics of Japan, we were much impressed with the beautiful fabrics chiefly represented in the 54 exhibits of fine cotton, crapes, printed, figured and striped, and, without doubt, these articles will, in the near future, have a greatly increased sale in the Western markets; the principal manufactories being centred at Osaka. The total export value of Cotton fabrics in 1902, exceeded 20 million Yen.

That these goods are well suited to European requirements, and are produced at a low price, is well worth the attention of our Lancashire Mills and British buyers; the goods, being of a high-class character, will unquestionably attract attention in the British market.

The 50 exhibits of Mexico, comprising examples in Cotton cloths, shawls, blankets, belts, etc., etc., are to be noted as being goods especially made for native consumption, but the many exhibits are evidence of the great number of manufacturers engaged in producing Cotton goods for the home market.

Italy had 11 exhibits of sewing cottons, and 1 of printed fabrics, of the Italian Manufacturing Co., of Milan, but the latter were not especially noticeable either as to colouring or design. There were small exhibits from Peru of native cotton cloths; Nicaragua, cotton cloths; Costa Rica, cotton bands for saddle girths; Siam, 10 exhibits of cotton cloths for native use; China 3 exhibits from the Hua Sheng Cheong Cotton Cloth Co.,

of Shanghai, of cotton fabrics and sheetings ; a small exhibit by the Imperial Chinese Government of Cotton, plain and figured, also velvet and ribbon suited only for the native market.

Coming to the exhibits of Belgium, placed in the Pavilion, a most complete collection of bleached and unbleached, dyed, printed, plain and figured cottons was shown. The limited space allotted to this group in a great measure made the exhibit rather ineffective. The specimens, although small in size, proved the excellence of the manufacture of cotton goods from the looms of Courtrai, Ghent, Brussels, Termonde and other weaving districts. The goods shown by the eleven exhibitors were mainly for dress and household purposes, and of the class so generally used in Belgium and Holland.

The twenty-four exhibits from Brazil were marked by an especially interesting collection of cotton goods, suited to the South and Central American markets. As I understand that this is the first International Exhibition at which Brazil has been represented in this section, I desire to offer especial congratulations upon the well-arranged and varied exhibits in this group. At the present moment Brazil is unable to produce sufficient goods for her own consumption ; but, at no distant date, with the facilities of cheap and plentiful labour, and almost all machinery entering the country free of duty, the enterprise shown at the St. Louis Exhibition will, without doubt, be of immense benefit in the development of her manufacturing industries. The goods are of a kind entirely for home use, and are produced in the districts of Rio de Janeiro, San Paulo, Pernambuco, Maranhao, the Rio Grande do Sul, and several other districts, thus showing that the manufactories are well distributed.

The exhibits of Mexico, representing many varieties in cotton cloths, quilts, napkins, shawls, blankets, etc., while being entirely suited to home consumption, prove the progressive manufacturing industries which are being carried on in this country, the very equal character of the goods displayed, and the fact that they were represented by no less than fifty manufacturers speaks well of the efforts being made by Mexico to supply her own markets.

There was a small exhibit from Nicaragua, Peru and Porto Rico, of cotton cloths, also suited for home markets, and Siam was represented by plain, printed and dyed cottons for native use.

GENERAL REMARKS.

It is much to be regretted that only two exhibits came from Great Britain, especially as our production in printed furnishing goods, such as Cretonnes, Chintzes, Velvets and other decorative fabrics, is probably not excelled in the world, and had Manchester, with other machine printing centres, sent a collection, together with the beautiful and artistic designs in hand block printing, Great Britain could have made a display in this direction alone that should have been greatly to her advantage.

Group 55.

BRITISH EXHIBITS.

In this group it was only reasonable to expect that Great Britain would have been largely represented, especially in bleached Damask goods, as a very large Export business continues to be done with the United States.

Irish Linens were represented by Messrs. John S. Brown & Sons, and Messrs. William Liddell & Co., Ltd., well-known firms of Belfast, the specimens of Damasks attractively shown were of the highest class. The beauty of the designs, and fineness of quality, place both firms in the very front rank of Damask Manufacturers. The variety of goods displayed in Cloths, Napkins, D'Oyleys, Tray, Tea and Centre pieces, hemstitched and embroidered, were of great excellence, and here I would remark upon the artistic character of the embroideries, and the great taste shown in both of the exhibits. A Grand Prize was awarded to both firms.

A very useful exhibit of Scotch Table-Damask made by Messrs. Steel and Co., Dunfermline, Scotland, whilst not of the high grade of the Irish looms, represented a quality of goods much in demand for the home and export trade. A Gold Medal was awarded to this firm.

FOREIGN SECTIONS.

The exhibit of France, the most important in this group in point of variety, was represented by Mr. Edouard Defretin of Halluin (Nord) with a limited display of Damasks of very fine quality and some examples of bleached linen sheetings of the widest widths and very perfect in weaving. The Cambrics, Lawns, and Handkerchiefs, both hemstitched and embroidered,

exhibited by M. Etienne Mascré, of Paris, prove that France continues to hold her own in this particular class of fine weaving. The remaining fifteen exhibits of this country, comprising specimens of Tickings, Canvas, Dress Linens and dyed yarns, cables, cordage and threads, were of sufficient interest as showing the products in these goods, as was also a small exhibit of asbestos products, shown by MM. Chedville, Desire, St. Pierre, les Elbœuf (Seine Inf.), the most noteworthy of which was a printed material for use as Fireproof Curtains. Although possibly useful, the specimens shown were not attractive. A somewhat mixed collection of articles made from Ramie fibre proved that this product is capable of filling many useful purposes.

The next exhibit in importance was that of Belgium, but in a great measure the effectiveness of the exhibits was lost by the small specimens and scanty space allocated to this group in the Belgian Pavilion. I would, however, especially mention the part taken in the Exhibition by the various Chambers of Commerce, and the very complete representation of the linen products of this country collectively brought together.

Flemish linens date from remote times, and the linen industry at the present time employs some 18,000 persons, of which about one-half that number are engaged upon hand looms.

The Damask linens exhibited by M. Rey, Aîné, of Brussels, M. Leopold Bant, of Courtrai, and other firms were of a kind suited to an export trade. The fabrics of flax tickings, Canvas, Cambrics, Lawns, Handkerchiefs, Hemp and Jute Fabrics, sack-cloths, packing-cloths, sail-cloths, canvas for making linoleum and oil-cloth, and other purposes for which these fibres are used, were all methodically represented:—specimens of jute fabrics mixed with cotton threads and largely used for curtains and the upholstering of cheap furniture. The latter were very attractive, both in design and colouring, and produced at a low price.

The exhibit of Brazil, arranged with the many other products of this country in a special pavilion, and presided over by a lady member of Jury 7, was not only instructive, but marked by the keen energy of the officials in attendance to present to the notice of the Jurors every point of interest in the manufactures of this country, and the artistic catalogue presented to us well justified their desire in this direction.

The goods generally exhibited in this group were of considerable merit, and our attention was called to a native fibre named "Aramina" for which is claimed many advantages over Jute. The Experimentors upon this fibre, Messrs. Silva Teller and Co., of St. Paulo, speak of it in these terms. I quote briefly from a pamphlet referring to its merits :—

"The new fibre now to be worked in Brazil, and the initiative of its industry, belong to the state of San Paulo. Its qualities have gradually been shown by the experiments of Dr. Silva Teller, of the Polytechnic school in San Paulo—its resistance is no point inferior to that of hemp, its brilliancy is equal to flax. The name 'Aramina' comes from 'Arame,' a Brazilian word for 'wire.' It may be bleached like Flax, takes a brilliant dye perfectly, and is a plant grown over all Brazil. It is a native wild-growing plant, and is now being cultivated on a large scale. To foster the industry, the Government have ordered that coffee exported in 'Aramina' bags are subject to a 9 per cent. ad. val. export tax, instead of 11 per cent., the common tax on coffee. The goods now exhibited are samples of the products of the early days of a new industry, and are not perfect, the machinery being defective."

The Jurors were not agreed upon the potential value of the fibre, as the examples shown were somewhat crude and appeared to require more care and skill in preparation. It may, however, be of sufficient interest to the Dundee and other manufacturers in this country to acquaint themselves with this product.

The exhibits of Japan, ten in number, a small collection of Handkerchiefs, Table and Household Linens, were not remarkable, but in the character of goods shown, which demonstrated a desire to produce for the export trade. The examples, however, of canvas and sail-cloths were certainly quite equal to anything of the kind made in Europe.

The exhibits of Italy, Mexico, Venezuela, Porto Rico, Nicaragua, Cuba, and the Argentine, etc., comprising cordage, cables, ropes and twine, were, to those identified with this branch of commerce, interesting from the point of view of comparison.

The very excellent exhibit from India, of the Gourepore Jute Co., Ltd., of Calcutta, reminds us of the importance of the Jute industry of India. The teak carved showcase of elegant Indian design and workmanship was a fitting receptacle

for the articles it contained, and the excellent position allotted to this exhibit in the British Court of the Varied Industries Building was a continual reminder of our great Indian Empire. The importance of the Gourepore Mills, giving employment to 6,000 native operatives, supervised by 22 Europeans, and having 1,255 looms and 20,844 spindles in work, is a sufficient indication of the importance of the company. The illustrated Catalogue showing the various processes of drawing, spinning, weaving, mangling, and baling, with views of the mills, workmen's dwellings, etc., show the undertaking to be on a scale of magnitude probably not exceeded by any other jute mills in the world. The Jurors were unanimous in recommending a Gold Medal to this exhibit.

A few exhibits from the Chinese Government of cordage, cables, ropes and twines, and from four private firms from Canton City of Grass Cloths for dress purposes do not call for special mention, as these goods are almost exclusively for home consumption.

GENERAL REMARKS.

Taking the exhibits of flax and kindred fibres as a whole, it was disappointing to find so few British manufacturers represented.

Surely this great staple industry of the North of Ireland, doing probably as large, if not greater, volume of trade in woven goods with the United States than that of any other textile industry in Great Britain, should have been more adequately represented than by two manufacturers! The two firms exhibiting have branch houses in New York. I much regretted to find so limited a representation, as in this branch of the textile industries we have so well held our own. This is an important subject for those interested in Belfast and the North of Ireland to look into, or Austria and Belgium and other countries will come to the front. In this connection I would like also to ask why it is we hear so little of the manufacture of Ramie fibre in Great Britain? In the examples exhibited in the French section its possibilities for a very large number of purposes are very great indeed, and I have seen beautiful specimens of weaving from this fibre in the Calcutta Museum.

Group 56.

In this group Great Britain was conspicuous by her absence, and the Tariff question was, without doubt, the sole reason for this.

The 107 exhibits principally represented by France and the United States, the fifteen exhibits of the latter of woollen and worsted cloths for men's wear, uniform cloths, flannels, dress fabrics, mohair plushes were not remarkable from the point of novelty, but were a sufficient indication of the progress that is being made in the woollen industries of the United States. The exhibits of the American Woollen Co., of Boston, of goods for men's wear, and uniform cloths, as used by the United States Government, were good in quality and finish, the fancy cloths for men's wear pointing very clearly to patterns made in our English Mills. The flannels and blankets of the Bolland Vale Mills, Mississippi, the Pendleton Woollen Mills, Oregon, the Seymour Woollen Factory, Indiana, the Charlottesville Woollen Mills, Virginia, demonstrated the fact that the Textile manufacturing industries are no longer confined to the Eastern States, but are gradually being installed in the far west. From the New England States, the exhibits of L. C. Chase and Co., of Boston, of Mohair Car and furniture plushes and rugs almost entirely replacing the goods of this class, which, until a few years ago, were imported from Europe.

The Coheco Woollen Manufacturing Co., of Rochester, New Hampshire, and the Gonic Manufacturing Co., of Gonic, New Hampshire, made displays of broadcloths, kerseys, covert coating, etc., of very considerable merit.

Several Boston commission houses also made collective exhibits of similar goods, and the installation of the United States Woollen Textiles exhibited in the Department of Manufactures, grouped as a whole, was exceedingly effective and interesting, and pointed to a not far distant date when, excepting goods of the "haute nouveauté" class, America will be supplying not only her own, but foreign markets from her mills.

In the French section the exhibits, principally the production of the Roubaix districts, of plain piece-dyed and novelty dress goods, representing the materials of the past season's vogue, were well displayed, the cloths from several manufacturers at Elbœuf and Sedan of sufficient variety to be attractive, whilst

the yarns and combed wools of Corbie (Somme), Glageon (Nord), and other districts contributed to make, as a collective exhibit, a representative and attractive show of the Woollen industry of this country.

Belgium made eight exhibits of cloths for ladies' wear, Military cloths, Dress goods, Blankets and Felts, and knitted stuffs. From the district of Verviers a small collection of carded and combed wool yarns. It is in this locality that the bulk of the washing, cleaning, combing, and spinning of wool is done, and the machinery is of the most modern construction. At the present time Belgium is importing from Buenos Ayres about $13\frac{1}{2}$ million kilos of raw wool and some 6 million kilos from Australia, and using $1\frac{1}{2}$ millions of European wool.

The re-exportation of combed wools, especially to Germany, is very considerable.

A small exhibit from Brazil of cloths for men's wear and an excellent variety of Cassimeres and fancy mixtures, shawls and blankets shown by twenty manufacturers from Mexico, prove that both these countries are making rapid progress in the manufacture of woollen goods suitable for their own consumption.

The single exhibit of Nicaragua of fancy mixed silk trouserings possessed some merit.

Italy had a small exhibit of wool yarns and blankets, of no special importance.

It was quite refreshing to find located in the far removed Palace of Agriculture a most interesting exhibit from New Zealand of blankets and woollen travelling rugs made by the Mosgiel Woollen Manufacturing Company of Otago, both in quality and finish of the very highest merit. It was unfortunate that the very attractive exhibit from our far-off colony was not more conveniently shown with the same class, in the Manufactures Building, as, being so distantly placed, the goods were less noticeable than the quality of the exhibit justified.

Bulgaria was represented by a small exhibit of woollen cloths and yarns, and a rather important collection from Portugal of men's cloths, shawls, and blankets; the products of its factories is a proof that the woollen industries of this country are in a satisfactory condition.

GENERAL REMARKS.

Whatever may be the reasons for Great Britain's entire abstention from exhibiting examples of her woollen industries at the St. Louis Exhibition, it appears to me to be very regrettable, but every allowance must be made for the feelings of manufacturers, who, through the McKinley Tariff of 1895, have lost, in the past year, in the export trade of woollen goods to the United States close upon $3\frac{1}{2}$ million sterling from the Bradford district alone. The Exhibition did not prove, from the goods shown, that any country had yet reached Great Britain in the quality and taste of her woollen productions, especially as manufactured for men's wear. It was, therefore, an opportunity lost of showing, not only to the United States, but to the world at large, that Great Britain still retains a very large share of the woollen industry, and the manufacturing of goods of the very highest order.

In this group, had a collective exhibit from Great Britain been made, the variety that could have been brought together would have far exceeded anything shown, and the various Chambers of Commerce would have had an opportunity of proving the value of their organisation.

In conclusion I would desire to express my personal appreciation of the very cordial and friendly reception I met with from the officers of the Exhibition, the amicable working with my colleagues upon the Jury, and the courtesies shown me by the British Commissioner-General and his staff.

J. M. CAMPBELL.

REPORT BY J. O. NICHOLSON, Esq.,

BRITISH JUROR FOR SILK FABRICS.

BRITISH SECTION.

The exhibits of British silks, though few in number, included a wide variety of fabrics and examples of many modes of treatment. The productions of Messrs. Grout & Co., Ltd., comprised silk crapes, crêpes de chine, chiffons, voiles, and grenadines; those of Messrs. Liberty & Co., Ltd., light silks chiefly for dress purposes, in pure and spun silks, plain, figured and printed; those of Mr. J. O. Nicholson, of Macclesfield (member of the Jury), were chiefly rich brocades for ladies' use, and damask silks, all of pure silk, for upholstery purposes; a heavy soft quality of plain satin for dresses was a remarkable feature of the exhibit. Under the name of "The Macclesfield Embroidery School," Mr. Nicholson showed various silk fabrics with the addition of hand embroidery.

The indisposition of manufacturers to show their goods at St. Louis is attributable to the high tariff duty which is almost prohibitive. In fact, but for the personal request made by the British Royal Commission most likely no exhibit of silks would have been sent from the United Kingdom.

AMERICAN SECTION.

By the exhibits of the United States it was proved that its silk trade was great and increasing, and this was confirmed by the official statements made before the Jury. The production is highly protected against European competition, and the home market is wide and constantly becoming larger. The use of silk as a whole dress wear is everywhere seen, the summer climate making the thin, light and cool fabric most suitable. Fashion also dictates that silk must be used for men's neck-wear, and the domestic production is increasing, one New York firm declaring that "now eighty per cent. of such neck-wear is home made." The production includes velvets, brochés, plain and brocaded satins, taffetas (plain, figured and printed), linings,

crapes, picture silks, name labels, ribbons and sashes in endless variety. Certain cheap lines of dress goods in black and colours are being cut in price and advertised largely. There is a tendency to remove the manufacturing to districts where labour is cheaper and taxes lower, and generally there is a complaining tone of undue competition, bad trade, and above all of "no profits" to the manufacturers. The Silk Association literature asserts that many makers are not possessed of capital, and that the trade is largely, and not for its good, in the hands of commission agents. This aspect is in spite of the sixty per cent. protective duty.

FOREIGN SECTIONS.

The same reason accounts for the fact that Switzerland, whose silks were so magnificent a part of the Paris Exhibition of 1900, almost entirely absented herself, and that Germany with the sole exception of the crimson silk damask which hung in the German Imperial Pavilion was unrepresented. At one of the meetings of the Jury the German representative, Mr. Paul Schulze of Crefeldt, made the statement that "The high tariff had killed the silk trade which formerly Germany had with the States." Russia also, who made a fine display of gold and silver brocades for ecclesiastical uses in Paris in 1900, failed to exhibit in St. Louis. The exhibits of silks were still large, interesting and educational.

France.

France was, as ever, to the front in the large range of fabrics of exquisite design and colour, in broad silks almost exclusively for robes and for dress materials. Not only, though mainly, in woven effects but including warp printed and fabric printed, as also to a remarkable extent considering its cost, hand painted examples. As a passing, though not commendable style, mention may be made of designs in "rubber" or adhesive treatment. In velvets and hat silks the exhibit of France was exceptional. The fabrics shown by Lyons included printed velvet broché, taffetas and satins, brocaded nets, gauzes, chiffons and crapes; rich brocaded satins, crêpes de chine and mousselines; printed silks, satins and damask; velvets and peluches; and piece dyed goods. St. Etienne sent ribbons and galloons in silk, satin, velvet and embossed satins, with excellent label ribbons.

Italy.

Italy was notably pre-eminent in rich tissues of silks combined with gold and silver threads, mainly for church decoration or ecclesiastical purposes. The exhibit from Caserta, where the production is "from the worms to the woven fabric" was noteworthy, as well as that of reproductions of ancient stuffs by V. Ferrani.

Germany.

The one exhibit of Germany, the damask before named, was in design and colour as well as texture a copy of an ancient silk which had been manufactured specially under the guidance of Mr. Schulze, the director of the Crefeldt Technical School and Museum.

Bulgaria.

Bulgaria made a collective exhibit by twenty-five firms showing interesting gauzes, mixtures of silk and gold threads and silk and cotton cloths.

Mexico.

Mexico had a collection of coarse silk shawls.

Siam.

Siam made a show of scarves and robes in native silk, with gold and silver threads and sequin embroideries.

China.

China, by its Government, exhibited varied fabrics, and the provincial Government of Kiangnan velvets, gold and silver brocades, crapes and damasks.

Japan.

The most startling exhibit was that of Japan, its range being in number and variety most extraordinary. Plain and figured silks predominated; some damasks and brocades being shown, and additionally pictured silks of most intricate workmanship. A number of makes gave examples of "Kaiki," being an imitation of the old Indian "tied work," evidently for a time a fashionable article. It was singular that fabrics specially made for the Chinese market could be shown, this in face of the fact that China for untold centuries has been a silk-producing and manufacturing country. A special feature of the

Japanese exhibits was their "collective" character, some of the Associations numbering 200, 600, 700, 1,200, and 2,000 manufacturers. From the statements made by the Japanese jurors it was calculated that the number of weavers must be approaching two millions. One association stated that it had 21,784 hand looms and 224 power looms, and that it manufactured silk goods to the value annually of \$5,500,000, silk mixed \$1,950,000, and cotton \$50,000; a total of \$7,500,000. In the number of awards (not in value) Japan stood easily first, taking nearly half of the whole. In raw and thrown silks, whilst China took only one silver medal, Japan out of a total of 200 awards carried off 167. To the cost of the exhibition of Japan's production the Imperial Government contributed \$400,000, and the Provincial Government \$200,000; beyond these were the private large expenditures.

GENERAL REMARKS.

The efforts at St. Louis of Italy, France, and Japan prove that their productions still have a market in the States; the textiles of Italy and France are exceptional, the States not having apparently attempted to any great extent similar manufactures, and the fabrics of Japan, by reason of cheapness and peculiarity of make, retain the market. In each instance it was said "that it was still worth while to exhibit in the States." All these countries are represented in the States by their own countrymen resident there, and, in the case of France, at least, branch manufactories had been established.

The awards of the International Jury were not given in competition, but each country's exhibits were judged from the view of excellence of quality, of design, and of colour. Cheap and inferior silks were also regarded in the light of their suitability for certain markets and their meeting a demand for a low-priced article.

A strong view was taken by the majority of the Jury that the award standard of former International Exhibitions should be a prominent element in the judging of the exhibits at St. Louis, it being always recognised that any apparent deterioration in value in any point would influence the judgment.

It was also determined that exhibitors not being the actual manufacturers of the goods shown should not be awarded prizes as if they were the makers. In one instance amongst the United

States exhibitors the name of one was excluded and the award given to the ascertained actual manufacturer.

It may be noted that in the case of France and the United States of America the exhibitors offered much detailed information to the Jury intended to have influence upon their judgment; for instance, the date established, the number of workpeople, the raw material and its value, the extent of the production, the length of service of the employees, and the awards obtained at previous exhibitions.

J. O. NICHOLSON.

REPORT BY A. BLACKBORNE, Esq.,

BRITISH JUROR FOR LACE AND EMBROIDERY.

In these particular groups the Jury consisted of twenty-five members—twelve Americans, four French, one British, one German, one Italian, one Austrian, one Hungarian, one Mexican, one from Porto Rico, one Japanese and one Chinese. The president was an American and the vice-president a Hungarian.

The Jury met on September 2nd, and in consequence of the general American catalogue being late in publication, were unable to commence their work at once. The whole of the laces shown by Great Britain were exhibited in a court specially erected by the Royal Commission, under the advice of Mr. Alan S. Cole, C.B., the idea originating from him for which all praise is due, and the Jury, thinking the same on the subject, recommended him for a Commemorative Diploma. I think this principle ought to be and will be carried out on a larger scale in any future exhibition that may be held. For the description of the court I can do no better than quote the official catalogue—

“The Court in which the collection was arranged had been erected from the design of Mr. F. Stuart Murray by Messrs. Warings, Ltd., of London, etc. In plan it consisted of a double court, having a main southern entrance on the line of its central axis, with four side entrances—two on each side, east and west. Each court was rectangular, and the cases which contained the exhibits formed a glazed continuous portico surrounding a central open space. The exterior had been designed with a first regard to the suitable display of a series of panel paintings, illustrating laces and embroideries in costumes from the sixteenth to the nineteenth centuries, and was an architectural composition of pilasters of the Tuscan order with panels or bays between the pilasters. The style may be considered to be English based upon architecture of Sir Christopher Wren’s period. The entrances were surmounted by bold curved pediments carrying the achievement of the Royal Arms of Great Britain and Ireland, and were hung with curtains. Three pairs of these were of embroidery from (1) the Royal School of Art

Needlework, South Kensington, London (main south entrance); (2) the Macclesfield School of Embroidery (south-west entrance), and (3) the embroidery works of Mr. Arthur H. Lee, of Warrington, and also of 31, Union Square, New York (south-east entrance). Of the remaining two pairs, one was of printed velvet by Messrs. Turnbull and Stockdale, of Manchester and London (at the north-east entrance), and one of woven tapestry by Mr. Arthur H. Lee, of Warrington, and also of 31, Union Square, New York (at the north-west entrance). The interior treatment of the Court was of a simple classic type. Narrow pilasters divided the space into bays, above which was a light entablature. The pilasters sprang from a low base about two feet high, which gave the floor-line for the glass cases containing the various objects exhibited.

“The twelve paintings on the exterior were adaptations by students at various Schools of Art in England and Scotland of portraits by old masters, as follows:—On the western façade, (*a*) Gaston de France, Duc d’Orleans, by Sir Anthony Van Dyck, in the Museum, Chantilly, France, adapted by Joanna Herbert, School of Art, Glasgow, and illustrative of early seventeenth century pillow-made flat lace; (*b*) the Wife of Nicholas van Berensteyn, by Franz Hals, in the Louvre Museum, Paris, adapted by Charles Dowell, School of Art, Glasgow, and illustrative of early seventeenth century gold-thread embroidery and Reticella lace: (*c*) William van Huythuysen, by Franz Hals, in the gallery of His Highness the Prince Liechtenstein, Vienna, adapted by Isabel Hotchkiss, School of Art, Glasgow, and illustrative of early seventeenth century Reticella lace. On the main southern façade, (*d*) Queen Elizabeth, by F. Zuccherro, in the collection at Chatsworth House, Derbyshire, belonging to his Grace the Duke of Devonshire, K.G., adapted by Winifred L. Stamp, School of Art, Regent Street Polytechnic, London, and illustrative of sixteenth century lace and coloured embroidery; (*e*) King Charles IX., by François Clouet, in the Imperial Gallery, Vienna, adapted by W. A. Chase, School of Art, Regent Street Polytechnic, London, and illustrative of gold thread embroidery; (*f*) Countess of Derby, by Cornelius Janssens, in the Victoria and Albert Museum, South Kensington, London, adapted by W. A. Chase, School of Art, Regent Street Polytechnic, London, and illustrative of seventeenth century flat pillow lace; (*g*) Jacques Bénigne Bossuet,

Bishop of Meaux, by Hyacinthe Rigaud y Ros, in the Louvre Museum, Paris, adapted by Charles W. Sharpe, School of Art, Liverpool, and illustrative of pillow-made lace of the late seventeenth century; (*h*) A Princess of France by Pierre Mignard, in the Museum, Niort, France, adapted by Albert W. Dodd, School of Art, Liverpool, and illustrative of rose-point Venetian needlepoint lace of the middle of the seventeenth century; (*i*) Marie Leczinska, Queen of France, by Carle van Loo, in the Louvre Museum, Paris, adapted by Gilbert Rogers, School of Art, Liverpool, and illustrative of eighteenth century Alençon needle-made lace and gold and silver gimp work. On the eastern façade, (*k*) King George III., by A. Ramsay, from an engraving by W. W. Ryland in the National Art Library, Victoria and Albert Museum, South Kensington, London, adapted by Allen R. Gladwell, School of Art, West Bromwich, and illustrative of eighteenth century gold embroidery; (*l*) Princess Charlotte, by G. Dawe, R.A., in the National Portrait Gallery, London, adapted by M. Thekla Pearce, School of Art, West Bromwich, and illustrative of nineteenth century pillow-made lace; (*m*) Queen Adelaide, by Sir W. Beechey, R.A., from an engraving by S. W. Reynolds in the National Art Library, Victoria and Albert Museum, South Kensington, London, adapted by Clara E. Sandiland, School of Art, West Bromwich, and illustrative of nineteenth century appliqué lace on net."

The largest exhibit in the British Section, viz., of twenty articles, was made by Messrs. Haywards, and they were awarded a Grand Prize, which the exhibit fully deserved. The Youghal needlepoint *godet berthe* was particularly worthy of notice, both on account of design as well as the quality of the work. Of the twenty articles sixteen were of Irish and four of Devonshire.

Another exhibit worthy of praise was that of Miss Audrey Trevelyan, who showed a lace dress of Honiton guipure, a fan and length of guipure; the work of the dress was very good, but the design and arrangement could be improved upon without much trouble.

Five convent schools in Ireland exhibited, and the whole of their work showed improvement to the work that has been shown in former exhibitions; their exertions in each case were recognised by an award.

The Convent of Mercy, Killarney, exhibit was particularly good in design as well as in workmanship, though for commercial purposes, when the American duty of sixty per cent. is added, the price looks high.

The Convent of St. Louis, Carrickmacross, showed some extremely good lace of the district, which ought to find a ready market.

The Municipal School of Art, Cork ; the Home Industries, Donard ; the Lace School, Crossmaglen ; these schools showed good examples, though as yet they have not reached the excellence of the convent schools.

Buckinghamshire lace was represented by two exhibits, viz., the North Buckinghamshire Lace Association, which exhibit received a Gold Medal, and the Buckingham Pillow Lace Industry, a Silver Medal.

Devonshire was represented by four exhibits, one of which, of Miss Audrey Trevelyan, has been noticed, and that of Miss Ellen Herbert being *hors concours* was not awarded a prize solely on that account, as the exhibit was a fine one.

Mrs. Fowler showed a fan of Honiton lace made for H.R.H. the Princess of Wales with a collar and double fichu ; a Gold Medal was awarded which was richly deserved. Mrs. S. Pearson showed an altar cloth border of lace which received a Silver Medal, and if the design had been considered more suitable no doubt it would have received a higher award as the exhibit was good. The remaining two exhibits, viz., of Mrs. Vere O'Brien and Miss H. A. Sivewright, do not call for any particular notice.

The embroideries in silks and colours were represented by seventeen exhibitors, and chiefly amongst them was the Royal School of Art Needlework, the President of which—H.R.H. Princess Christian—assists so much with her artistic taste and knowledge. The exhibit consisted of eight articles, each of which was much admired, and a Grand Prize awarded. The exhibit of F. and R. Vigers and Miss Mary Symonds was of a different style and equally good as to the workmanship and design ; it received a Gold Medal, though, to my idea, it merited a higher award.

The other exhibits do not call for any special remark.

In conclusion, I think that in the case of any future exhibitions which may be held, if the exhibitors knew their

goods would be shown in an artistic and attractively decorated building, arranged at the expense of the Government, Great Britain would make a show equal to her competitors in trade of other countries. The artistic arrangement and display of the exhibits of the whole of the German section was an object-lesson to every country.

ARTHUR BLACKBORNE.

REPORT BY DR. C. V. DRYSDALE,

BRITISH JUROR FOR ELECTRICITY.

It is difficult to form any just estimate of the British position in the Electrical industry from the St. Louis Exhibition, from the fact that the distance of St. Louis from Europe, combined with the small prospect which any foreign country could have of finding or extending their market in America, resulted in there being little inducement to European manufacturers to go to the trouble and expense of sending heavy machinery. In consequence, the only foreign countries which made any exhibition of an engineering nature were France and Japan, while the utterly unrepresentative character of these exhibits completely justified the British, German and other Governments in having restricted their exhibits almost entirely to electrical instruments. With the present high protective tariffs, almost the only opening for European electrical manufacturers in America seems to be in the department of scientific instruments, in which both Great Britain and Germany have, up to the present, been considerably in advance of America, although strong efforts are being made by some of the American firms to catch up, and European firms will have to reckon with them in the future. With consideration of special American requirements there ought to be a considerable American market for scientific instruments for some years to come, and this market will be practically held by Germany and Great Britain. It will therefore be advisable for British firms to look well after their interests in that direction, especially as the German competition is very severe. Turning to the exhibition itself, it is gratifying to be able to state that the British combined electrical exhibit was decidedly the finest of the foreign displays. That of France was larger but was devoted considerably to artistic fittings and small accessories, while the German instrument exhibit, though perfect of its kind, was practically confined to the Reichsanstalt and four instrument manufacturers. The British exhibits also commanded a considerable amount of public and professional attention from the fact that wherever possible they were shown

in operation. In none of the other foreign exhibits was this the case, and great credit is due to Mr. Dixon, in charge of the British electrical section, for his energy in arranging these demonstrations, and for the way in which the apparatus was displayed and explained. As regards the catalogues, the British catalogues, like the exhibits, were, I understand, the only ones in readiness at the opening of the exhibition. The particulars were fairly complete, but the example of the Germans, who made their catalogue an illustrated handbook describing their instruments, might have been followed with considerable advantage.

Group 67.

In this group the British exhibits were confined to a working model of the mono-rail, some switches and small motors. The American exhibits in this direction were, of course, very fine. Steam turbine alternators using the Curtis and Parsons types of turbines are being turned out in immense numbers, and appear to be rapidly displacing the reciprocating engine sets. The attention of British manufacturers is most especially called to the single phase traction motor which is now in successful daily operation in America, and will probably appear over here shortly. Both Continental and American manufacturers have given great attention to the extremely important problem of single-phase traction, and British manufacturers ought not to be behind-hand. It is unfortunate that no British high tension switchgear was exhibited in comparison with the American universal practice of employing oil break plunger switches, actuated by series motor or solenoid, situated in remote fire-proof chambers, and actuated by auxiliary low voltage D.C. supply from a small board showing diagrammatically the entire connections of the station. This "remote control" system appears to have superseded every other in America with satisfactory results, and British manufacturers of switchgear should give it their attention.

Group 68.

Little need be said about this group. One British exhibit only was shown in this group, that of Sherard Cowper-Coles, which was of considerable interest. The exhibits of other countries were mainly of small electro-chemical apparatus or of products, practically no electro-chemical process being shown in operation. It is perhaps worthy of note that the bulk of the

secondary cells used in the States appear to be of what is known over here as the "Chloride" form.

Group 69.

In this group there was no British exhibit of special interest. Nothing need be said concerning the American exhibit, except that the General Electric Co. have succeeded by combining glow-lamps with mercury vapour lamps in producing a light of fairly normal colour effect with considerable economy.

Group 70.

In this group the exhibit of the British Post Office was the finest display in the Exposition relating to ordinary land telegraphy, while Messrs. Muirhead's exhibit of cable signalling and testing apparatus was unique. The specimens of telegraphic and telephone cables exhibited by the India Rubber, Gutta Percha & Telegraphic Works Company were also of considerable interest. None of the other foreign exhibits were particularly worthy of note, while in America the exhibits of the two large cable companies showed little of originality. There appears to be little field for introducing new telegraphic inventions in America, American inventors themselves complaining that their opportunities in their own country were very limited, and that Great Britain was much more ready to give new ideas a fair trial. It is unfortunate that no British exhibit of wireless telegraphy was made to compare with the American De Forest system, which was shown on a magnificent scale, and was in successful regular daily operation for distances up to 300 miles overland. In telephony the automatic exchange system appears to be successful and to be gaining ground.

Group 71.

The bulk of the British exhibits came under this group and were most of them very satisfactory. Taking measuring instruments of precision first, the Kelvin balances still hold first place as current standards. For P.D. measurements, only one solitary Weston or Cadmium cell was exhibited in the British section, although these were shown by both American and German firms, and will almost certainly supersede the Clark cell in the near future.

It is satisfactory, however, to note that Messrs. Crompton and

Co., Limited, exhibited a potentiometer adjusted for the Weston cell. Of the potentiometers shown by British firms nearly all were of the slide wire form, while those exhibited by Americans and Germans were universally composed entirely of coils. This is a matter of considerable importance in current measurement by potentiometer, as in the British form P. Ds. of $\frac{1}{10}$ th volt, or less, have to be measured on the slide wire only, which limits the accuracy considerably. It is difficult in the case of large currents to allow more than 1 volt drop in the resistance without making it unduly cumbrous and expensive, or permitting injurious heating, and this is the limit in German low-resistance standards, while the British forms usually allow a drop of 1.5 volts. The slide wire potentiometer has the advantage of lower resistance and fewer sliding contacts, and its legitimate application would appear to be in cases where this is necessary, as in measurement of Thermo forces, &c.

In the matter of resistance coils and standards the principal British manufacturers appear to have made little advance during the last ten years, although the quality and finish of the work is good, and much greater attention ought to be paid by them to German work if they are to hold their place. Not one good form of standard resistance was shown. Platinum silver coils with their high temperature coefficient, and long thin copper leads for the B.A. gauge of bridge have long been discarded by other countries, and we ought certainly to follow suit. The cardinal requirements for standard resistances after constancy are:—open winding, oil immersion, circulating arrangements, low temperature coefficient, and short stout leads. The standard resistances designed by the Reichsanstalt are almost perfect in these respects, and similar forms should be made in this country. Oil circulation is specially necessary in low resistance standards.

As to ordinary resistance boxes, in the first place, it is to be regretted that the practice of waxing the coils still survives in one or two instances in Great Britain. This ought to have been absolutely discarded years ago. If British manufacturers wish to keep in the front rank attention must be given to the following points:—coils to be open wound or on metallic heat conducting bobbins, with large wire of negligible temperature coefficient, and high resistance coils to be subdivided to reduce their electrostatic capacity (this latter point is of considerable importance for inductance or alternate current work). The

boxes should be in the form of a tank which can be filled with oil if required, with means for circulation, and it would be desirable with each box to state the maximum currents the various coils would carry without injury. Attention is called to the American "decade" arrangements of connection, by which the convenience of a dial bridge is secured with four instead of nine coils per dial, and to the device adopted by both German and American makers by which the ratio coils can be interchanged. Again much more attention is required to the matter of sliding contact resistances. Both American and German makers have succeeded in producing sliding contacts which are almost, if not quite, as good as plugs, with much greater convenience.

As regards galvanometers and capacity and inductance apparatus, British manufacturers appear to be pre-eminent, although the Americans are beginning to produce some very good moving coil galvanometers. For inductance measurements German and American firms favour the alternating current bridge with telephone detector or vibration galvanometer, instead of the commutator secohmmeter as in England. The latter is, however, probably far superior in accuracy. British testing sets are also very good, but attention is called to the fact that American makers arrange their sets for both direct and alternate currents with a telephone as well as a galvanometer, and include a small variable standard inductance which enables capacity and inductance measurements to be made, and greatly increases the usefulness of the sets for telegraphic and telephonic work. The "decade" arrangement of the coils enables space to be found for these additions without increasing the size of the set.

Turning to commercial measuring instruments, in this respect British manufacturers were fairly well represented. A notable omission however was in the absence of any exhibit of British supply meters. In the United States two forms of meters only are employed, both of the motor type, the Thomson for the direct currents, and the induction meter for single and polyphase alternate currents, and it is open to question whether British makers would not do well to follow this example and develop these meters perfectly instead of distributing their energies over so many different types.

As to direct current ammeters and voltmeters, the Weston

moving coil instruments are much employed and are probably the most accurate and most perfectly constructed instruments of their class in the world ; British instruments of this kind are however very good and much less costly. In soft iron instruments British makers probably excel all others, while in special instruments for alternate current measurements some of our manufacturers are well to the fore, and it is gratifying to note, that although much remains to be done, British manufacturers seem to have realised more than any others the errors to which such instruments are liable, and have taken steps to eliminate them. The workmanship, however, on such instruments in some instances was not beyond reproach.

It is extremely fortunate that the jury were provided with the most exceptional opportunities for coming to reliable conclusions as to the merits of the various instruments, and were not obliged to make their awards from mere inspection. The authorities of the National Bureau of Standards at Washington had established at the exhibition a magnificent set of laboratories with generators and testing apparatus for both direct and alternate current testing of every kind, and of measurements of resistance inductance, etc., of the highest precision, the temperature of the laboratories being thermostatically controlled. Instruments were selected from each maker for actual test, and although details cannot be given, I think I am justified in stating that practically all of the British instruments were found very satisfactory as to accuracy and general behaviour.

It is impossible to sufficiently admire the zeal and energy shown by the authorities and staff of the National Bureau of Standards in equipping these fine laboratories and the care taken in making the tests. There can be no doubt that a central institution, such as the Berlin Reichsanstalt, can enormously profit the electrical industry, and that the Americans realise this is shown by the magnificent buildings and equipment they are now providing for the National Bureau of Standards at Washington. It is greatly to be hoped that our authorities will follow in granting the highest facilities to our own National Physical Laboratory.

GENERAL REMARKS.

The general impression derived from the Exhibition and from a tour of the Electrical Engineering works in America, is

that the electrical industry is in every way in a far more prosperous and progressive state in America than in Great Britain. This is unquestionably due considerably to superior natural resources and consequent demand for electrical plant, and also to the natural and artificial restrictions of foreign competition, but there are other reasons which appear no less important. In the first place, the combination of nearly all the small electrical firms into the two great companies has eliminated the extreme and ruinous competition, and the extreme waste of talent in this country. Where about six firms manufacture small generators and motors in America, at least forty turn out machines of slightly differing types in Great Britain, necessitating as many designs to be laboriously worked out and as many staffs of skilled engineers to superintend their manufacture. The problem of standardisation of machinery in consequence, which has been such a vexed question over here, and the absence of which has caused such great waste of expenditure, has practically never arisen in America ; and the economy of manufacture consequent on turning out vast numbers of machines of one type, combined with the amount of talent set free to occupy itself in various directions, has enabled them to spend large sums in investigations, and in the development of new ideas, resulting in rapid progress.

It will not be forgotten that British manufacturers were not ready to supply plant for traction work when the alteration of our laws rendered such work possible. Just in the same way America has now probably solved the problem of single phase traction, which will most likely enable the main railways to be successfully electrified in future. This has only been done, however, by the expenditure of such amounts in experiments as would frighten British manufacturers, and unless we are alive to the question, we may possibly in a few years be seeing all our large railways being equipped with American plant, just as we saw our tramways some few years back.

The fact would appear to be that in such a progressive and scientific industry as that of electrical engineering, a comparatively small amount of competition is necessary or desirable to produce the best results, scientific enthusiasm taking its place to a considerable extent, provided that this enthusiasm exists and has fair play. It would certainly appear as if the British electrical industry would gain by the co-operation, and even

amalgamation of several of the now competing firms, and above all, that the short-sighted policy of trade jealousy and secrecy should be discarded.

The second important reason for the success of the American manufacturer lies in his selection of the best material for his staff and workmen, and his treating them as human beings instead of machine tools. American manufacturers compete with one another in securing the best men from universities and technical colleges, instead of slighting and discouraging them and trying to destroy all their knowledge and enthusiasm. New ideas are welcomed and developed, not discouraged, and each employee feels himself a necessary link in the running of the concern, and that his progress depends solely on his merits. He is consequently always on the alert to suggest some improvement in the machine or tool, and the results in improved work and economy are apparent.

In concluding this report I wish to take the opportunity of thanking my various colleagues on the Jury for their uniform kindness and courtesy, and for their desire for the utmost fairness in the awards. British manufacturers may have the satisfaction of knowing that all awards were based on the most careful and impartial consideration it was possible to give them, and that the American members of the Jury were fully as anxious to do justice to them as to their own countrymen.

CHARLES V. DRYSDALE.

REPORT BY FRANCIS E. CUMING, Esq.,
BRITISH JUROR FOR TRANSPORTATION EXHIBITS.

In the Department of Transportation, consisting of the groups 72-77 inclusive, although the exhibits were not very numerous, yet owing to the great amount of space which many of them occupied, the building was the second in point of size in the Exhibition.

Group 72.

There was a fairly large display of motor-cars in this group, but some of the most famous continental builders were unrepresented and there was no exhibit from Great Britain. A noticeable feature was the total absence of bicycles. The Plywell Pole Appliance Company's device for equalising draught and facilitating backing in pair-horse machines was inspected by many visitors.

Group 73.

In this group the South American Republics had good exhibits, but it was somewhat surprising to find Great Britain unrepresented here.

Group 74.

Again in this group Great Britain was very scantily represented. The exhibit of the London & North Western Railway Company was, however, an object of much interest, not only for the ordinary visitors, but to the railway experts. The section of permanent-way attracted a good deal of attention, but the opinion was expressed that the method of fixing the rails in the chairs by means of wooden wedges would be unsuitable to the dry climate of the United States. The models of the British engines exhibited inevitably suffered in interest in comparison with the large number of actual engines which were on view in other parts of the building. A great many were shown by American Railway Companies, and nearly all of them were of immense weight and power, indeed the average weight was very largely in excess of that of the engines shown at Chicago in 1893, when it was thought that the limit in this direction had been reached.

The Exhibition Authorities had got together a remarkably complete collection of locomotives from the earliest times, commencing with a model constructed from a suggestion of Newton's. The greater number were the actual engines, and where these were not procurable full size models had been constructed. A testing-plant for locomotives had also been erected in the building and tests for speed, power, coal-consumption, etc., were carried out before the public.

The German locomotive by Messrs. Henschel of Kassel was an object of great curiosity and interest, by reason of its remarkable appearance. It was enclosed in a casing of sheet steel, which acted as a wind shield and a protection to the crew. It is said to have developed a speed of over 90 miles an hour, and requires a driver and two firemen.

The Pennsylvania Railroad Company showed very interesting models of their gigantic scheme for bringing their line into New York City by tunnelling under the Hudson River. They also showed a fine model of the new joint station at Washington.

Group 75.

I was appointed Chairman of the Jury assigned to this group, and my duties in this connection prevented me from giving as much attention as I could have wished to the other groups in the Department. The Cunard Company showed a most interesting historical series of models of their steamers, from the 200 feet "Britannia" of 1841 to the 750-foot four-screw turbine vessel now building. This was certainly one of the finest exhibits in the department. Among many fine collections of models may be mentioned those of the Anchor Line, City of Dublin Steam Packet Co., and Swan, Hunter, Wigham Richardson & Co. Among the exhibits of this last-named firm was a model of the new Bermuda Floating Dock.

The International Mercantile Marine Company, although exhibiting in the United States Section, found its chief title to interest in models of British-built ships, its principal feature being full-sized reproductions of cabins in the "Oceanic" and "Celtic" of the White Star Line.

The two great German lines, the Hamburg-American and the North German Lloyd, had very elaborate displays, the former showing a model of the now famous emigrant station at Hamburg, while each exhibited a large collection of models of

steamships, both hulls and interiors. Tecklenborn and Co. showed amongst other models a fine one of the largest sailing ship afloat. The Westphalen Propeller-Gesellschaft exhibited a patent propeller which is said to give better results than the ordinary pattern.

The great Japanese shipping company, the Nippon Yusen Kaisha, showed some remarkably fine relief maps and models of steamships. Quite a feature of the department was the magnificent reception-room in this section, which contained some wonderful embroidery, weaving in colour, and lacquer.

A few motor-boats and engines were shown in this group by United States manufacturers. Among these the Truscott Boat Company's was perhaps the most attractive exhibit.

Group 76 and Group 77.

There were no features calling for special mention in these Groups.

GENERAL REMARKS.

As to the Department as a whole, in only one group, namely, 75, can it be said that Great Britain was at all adequately represented, but in that, as was to be expected, the British exhibits were at least equal in importance and interest to those of any other country.

FRANCIS E. CUMING.

REPORT BY C. H. WATEROUS, Esq.,
BRITISH JUROR FOR PREPARATION OF FOODS.

Having acted as British Juror in Group 86, which comprised particularly food-preparing machinery, refrigerator machinery, and preservatives as they relate to foods, I beg to report that associated with me on this jury were Prof. Wilson of North Dakota, who was chairman (I was appointed vice-chairman), Prof. Leclerc of the Chemistry Department of Pure Foods, Washington, D.C., and Prof. Th. Ganzenmuller of Germany, and Mrs. Richard Bland of Missouri.

We examined the machinery and products in this group, which comprised considerable of British production, making the awards on the same. Much satisfaction was expressed by the members of the Jury at the large display made by British exhibitors, and the enterprise that they had shown in having so much of their machinery in practical operation, thus illustrating, by its production, the actual product of the machinery.

I was particularly pleased with the very friendly expressions of all the Jury, and particularly the American members, toward the British exhibitors, and their evident desire to award, as far as would be warrantable, the highest prizes to these exhibitors.

My work was rendered both pleasant and less arduous by this evidence of friendliness, and by the courtesy of the Commissioner-General for Great Britain and staff.

C. H. WATEROUS.

REPORT BY H. J. ELWES, Esq., F.R.S.,

BRITISH JUROR FOR HORTICULTURE AND FORESTRY.

HORTICULTURAL SECTION.

The exhibits in this section may be divided into two classes, namely, Flowering Plants, Trees, and Shrubs; Fruits and Vegetables.

Flowering Plants, etc.

In this class I was somewhat disappointed, for owing to the soil and climate of St. Louis, and its distance from the principal Nursery and Floricultural Establishments of the New England States, the exhibits made by American Nurserymen were not equal to what they would no doubt have been in any of the great eastern cities; and did not show the great progress which American Horticulture has made in the last ten years, both from an economic and an ornamental point of view.

A great number of beds of summer flowers which ornamented the grounds around the Horticultural and Agricultural Buildings were remarkable more for their great size, and the number of plants used, than for their novelty or arrangement.

Cannas were the only group of plants which really made a great show at the time when the jury was sitting, and these, favoured by the warmth of the climate, were much superior to what I have seen in England, though the individual varieties and novelties were not, perhaps, finer than what have been raised and grown in the South of France.

The one striking exception to the general uniformity of the ornamental bedding was an extremely fine collection of water lilies and other aquatic plants exhibited by Messrs. Dreer of Philadelphia, which filled a large pond, and were in my opinion by far the most meritorious exhibit in this section.

The foreign exhibits in these classes mostly took the form of gardens surrounding the pavilions and buildings of their respective countries; and though they contained fairly representative collections of annuals, lawn-grasses, roses, shrubs, and trained fruit-trees, in which latter the French were supreme, I saw

nothing, except a fine collection of cacti from Mexico, which calls for any special remark.

The British garden was designed by one of our most able landscape gardeners, Mr. Goldring of Kew, and his designs were carried out by his representative, Mr. T. W. Brown, in a manner which did the greatest credit to his horticultural skill and taste. The materials at his disposal, which consisted, with few exceptions, of common bedding plants and annuals, were made the most of under extremely difficult and trying conditions of soil and climate. The general effect of the British garden was good, and quite in keeping with the style of architecture of the Royal pavilion. The trained yew trees and other examples of the topiary art sent by Messrs. Wm. Cutbush and Sons of Highgate were much admired.

The French garden, which was of great size, and admirably laid out by M. Vacheraux, of the Municipality of the City of Paris, contained many collections of roses, fruit trees and shrubs ; and was in most respects the largest and best exhibit made in this Department by any foreign country.

The Japanese garden designed and laid out by Mr. Y. Itchikawa of the Japanese Commission, was also quite national in its character, and contained a considerable number of dwarf trained trees, in the cultivation of which the Japanese have such a world-wide fame, but the difficulties of transit over so great a distance had to some extent marred his efforts ; and coming, as I did, straight from Japan, I was not so much impressed as I should otherwise have been ; because the spring and early summer is the time at which Japanese gardens are at their best, and most of the flowering plants such as Irises, Lilies, and Pæonies had lost their beauty in September, whilst Chrysanthemums had hardly begun to flower.

Fruits, etc.

In the fruit classes the wonderful development of American Horticulture was splendidly represented. The Horticultural Building, covering nearly four acres of ground, was in the month of May filled with a collection of fruit, preserved mostly by cold storage from the previous year, of an extent, variety and quality which no other country could equal. It was arranged in State Exhibits, and was constantly replenished by fresh arrivals from time to time as the new season's fruit ripened.

Not only fresh fruit, but also dried, canned, and preserved fruits and nuts of infinite variety, surpassed anything of the sort previously shown in quantity and general high quality. The consumption of fruit among all classes in America is much greater than in Europe, or at least in Great Britain; and though Californian canned fruits are now to be had in most places, yet those who provide for the wants of the middle and working classes in our towns do not seem to have realised the variety and cheapness of the many kinds of dried apples, plums, and other fruits which form a part of every meal among the working classes of the United States; and for which jam and marmalade are almost the only common substitutes in Great Britain. In September the exhibit of fresh fruits was even greater than in May, the variety and size of apples in particular being wonderful. Late ripening oranges from California, of what is called the Valencia variety, were of a quality which I had never tasted in Great Britain at this season, and far superior to those which had been kept over from the last year's crop by cold storage.

Melons of many kinds were also very abundant. A small Musk melon called Rockyford Cantelupe, which originated in Colorado, and is largely exported from that State and from California to Eastern cities, was, in my opinion, superior in flavour to any melons I have eaten in Europe or Asia, except the celebrated Cassabar melon of Asia Minor.

Grapes alone were inferior to what we have in Europe, being for the most part varieties or hybrids of the American *Vitis labrusca*, of which the flesh and flavour is quite peculiar. I believe, however, that in California some of the European varieties come to perfection.

The fruits were very properly judged by American jurors, who alone could have the necessary local knowledge to decide which were best among such a bewildering number of local varieties, some of them unknown to Europeans. I will not attempt to say which States were most worthy of distinction, though to a stranger California seemed, both in quantity and variety, to be before all others, as she undoubtedly holds the first place in the fruit-producing countries of the world.

Outside of the United States only the Dominion of Canada made any large exhibit of fruit, and though not called upon to offer any opinion on a subject in which I am no specialist, I

must congratulate the Government of the Dominion on the very fine show that Canada made in this Department; and on the success of the efforts which have been made by the distinguished Director of the Experimental Farm at Ottawa, Mr. William Saunders, and the able Horticulturist, Mr. W. T. Macoun, to extend and develop the production of high-class fruit, especially apples. We have no need to go to the United States for apples as long as Canada can meet our growing demand for her excellent fruit; and though British Columbia must be to some extent handicapped by the cost of land transit, yet that province is rapidly coming to the front as an apple-producing country. The flavour, size, and appearance of the British Columbian and Nova Scotian apples are surpassed by none, and in many seasons are superior to what can be grown in Great Britain except in a few favoured localities; though in the present year they have not been considered, as shown at the Royal Horticultural Societies' exhibitions, equal to the best of our British apples.

I would, however, offer a word of warning to those who are producing apples for export to Great Britain, and that is not to multiply the varieties too much. In every district experience has shown that there will be one or more varieties which succeed best, and it is especially among the late-keeping winter apples that they can best supply our wants, only apples in fresh condition with good flavour being likely to be profitable to exporters. I am also inclined to believe that smaller packages which could be purchased as they are landed, without breaking bulk, by families not large enough to take a whole barrel at once, would be worth trying, if the quality was uniform throughout, and the name of the variety and place of production was marked on the box so that consumers could know what they were getting. The very large difference between the wholesale and retail price has, no doubt, checked consumption here.

I must also congratulate Mr. Taylor, Chief of the Agricultural Department, and his assistant, Mr. Taft, on their selection of Jurors. The gentlemen who acted on the Jury in the Horticultural classes were most capable, businesslike, and fair-minded, and had a thorough knowledge of the great number of exhibits which came under their notice. International jealousies were entirely absent and the awards were almost always unanimous.

FORESTRY SECTION.

The very extensive collections of timber and wood-specimens, the scientific collections and photographs illustrating the products of Forestry, and the numerous appliances relating to hunting and fishing were shown in one building, and probably represented the largest and most complete collection of similar objects ever brought together. It is impossible for me to notice in detail any but the most important exhibits; but it may be said that the products of what is, I believe, the fourth industry in point of value in the United States, were shown on a most liberal scale by nearly all the State Commissions. Several Foreign countries, of whom Germany, Japan, and Brazil were the most important, also contributed largely to the success of this part of the Exhibition. In this Department Great Britain could not be a large exhibitor, because, with the exception of high-class sporting-guns and a little fancy timber in the shape of brown oak, we export almost nothing to the United States.

By far the most interesting exhibit in the building was that of the United States Bureau of Forestry, which, though a comparatively new Department of Government, has under the administration of President Roosevelt and the energetic management of its chief, Mr. Giffard Pinchot, achieved an amount of work which must have an immense influence on the future of the timber industry in the United States.

The attention of the people and Government has been most forcibly directed to the fact that the immense forest resources of the country which a generation ago seemed inexhaustible, were being wasted by fire, axe and grazing at a rate far greater than natural reproduction could supply, by the writings of Professor C. S. Sargent, and by the admirable reports and bulletins published by the Forestry Bureau and the various State Commissions which have investigated the subject.

And though some of the most valuable timbers are being so rapidly exhausted that a continuance of the supplies exported to Europe, at a price with which British timber cannot compete, cannot long be looked for; yet the endeavours which are being made by wise legislation to avert this waste have already produced good results, though these laws are not always enforced so strictly as could be wished, especially in the Western States.

The United States exhibit, which was in charge of Mr. Gaskill, a most able, scientific, and practical forester, consisted of a large series of elaborate photographic transparencies, large coloured photographs, charts, relief maps, and specimens to show general and specific forest conditions throughout the United States, and the methods by which the timber resources of the country are utilised.

There were also specimens and charts showing the latest results of the testing of commercial timbers, and the value of wood preservatives ; which, though until recently quite neglected in the United States, are becoming of great importance to railway companies and other large consumers.

Among the State exhibits the most beautiful and extensive was that of California, whose ornamental timber is well worth more attention than it has received from British manufacturers. Immense planks of beautifully waved and figured redwood (*Sequoia sempervirens*), Douglas fir (*Pseudotsuga douglasi*), myrtle or laurel (*Umbellularia californica*), and other woods, surpassed everything of the kind in the Exhibition in size and beauty. Oregon also made a fine show of similar timbers with the addition of Port Orford cedar (*Cupressus lawsoniana*), a common ornament of our English gardens, which on the coast of Oregon produces a clean, close-grained, yellowish-white, fragrant, durable timber only second in its class to that produced by the Alaska or yellow cedar (*Cupressus nootkatensis*). Both of these timbers are practically unknown in this country and would be valuable for fine inside work, though their commercial production is confined to somewhat limited areas. Professor Sheldon, of Portland, Oregon, has written a pamphlet on the forest wealth of Oregon, which contains much valuable information on the trees and timber of this great wood-producing state and gave me much valuable help in my investigations.

The State of Washington, which produces the largest commercial timbers in the world, showed in her State Building squared balks of Douglas fir of immense length and thickness. One tree, of which a butt length was sent to St. Louis by the McCormick Lumber Co., was stated to have contained 79,218 feet board measure, and to have been 340 feet high, though I never saw a tree myself of this species more than about 300 feet in height.

Tennessee, Kentucky and North Carolina also sent very fine

exhibits of the hardwoods for which these States were, and still are, celebrated, though the increasing demand has very nearly exhausted the best of them, namely, the black walnut, of which one log was shown valued at 800 dollars. Yellow poplar (*Liriodendron tulipifera*), known in England as white wood and Canary wood, and now largely used in the furniture trade, was shown in plain and figured specimens, some of which are very ornamental and of which the supply does not seem to be so near exhaustion as supposed.

Arkansas, Missouri, and Mississippi, which are now the chief centres of production of the oak and of the red or sweet gum (*Liquidambar styraciflua*), known in England by the trade name of satin walnut, showed large collections of woods in logs and planks, many of which were more or less injured by want of proper seasoning, for which sufficient time is rarely allowed by American lumbermen. I may say of the *Liquidambar* that although its wood has obtained a notorious reputation in this country for street paving blocks, it is a valuable wood for furniture and other purposes when properly treated.

Georgia, Louisiana and Texas showed many fine timbers, amongst which the Florida or Swamp-cypress (*Taxodium distichum*) is most worthy of the attention of our consumers, as it is proved to be a most durable and valuable wood for many purposes, and is manufactured largely by some New England firms, among whom I may mention the Stearns Co., of Boston, Mass. The Savannah Board of Trade showed a large collection of the well-known products of the Pitch or long-leaved pine, whose timber is so largely used in England. A wood shown in Louisiana and Texas exhibits, which seems unknown in England, is that of the Osage Orange or Bois d'Arc (*Maclura aurantiaca*). Though not produced on a large scale this is one of the hardest, heaviest and most valuable woods for wagon wheels known in the United States (it has already been found of value in Europe for motor car wheels), and its young shoots, which were formerly made into bows by the Indians, are so tough that they seem likely to be valuable as handles for golf clubs and walking sticks. Another wood unknown out of the districts where it grows, in Montana, Idaho, and in Southern British Columbia east of the coast ranges, is that of the western larch or Tamarack (*Larix occidentalis*), which was well shown both in the log and in converted form by the Blackfoot Lumber Co., of Missoula, Montana.

This timber, on account of its great size, hardness, strength and durability, seems likely to be one of the most valuable in the United States, for all purposes where those qualities are necessary, and, if the cost of transportation to the coast does not prove excessive, is worthy of attention. I have already distributed seed of this tree, which is hardly known in Europe, to some of the best foresters in Scotland.

In the Wisconsin State Exhibit were some fine specimens of quartered white oak, curly red oak, figured black cherry (*Prunus serotina*), black walnut, curly birch, bird's-eye maple and plane. These woods, however, are not now so much in fashion in the United States as formerly on account of their increasing scarcity, and at Grand Rapids, Michigan, the seat of the best furniture factories in the United States, mahogany and other imported hardwoods seem to be taking the place of native woods, except oak, for all the best furniture.

The Forest, Fish and Game Commission of New York State showed a fine exhibit of Forestry Products, specimens and photographs, including no less than eighty different native trees, and also a nursery containing the trees used to restore the denuded forest lands of this State. Another exhibit of interest was that of Mr. Brown, of Connersville, Indiana, who showed specimens of the western catalpa (*C. speciosa*) in various forms to show its rapid growth and extreme durability in the form of telegraph poles, railway sleepers and posts. But, however desirable the cultivation of this tree may be in the middle west and in the Mississippi Valley, it seems to require a much hotter climate than ours to bring it to perfection, and, as it is not to be found at present in large quantities, is of more importance to Americans than to us.

Among Foreign Countries the most remarkable exhibits were those of Germany, which, as might be expected, were thoroughly scientific. Of the immense number of different samples of wood and other Forest products of Mexico, Brazil and Argentina, a large proportion were only named with local names, and therefore impossible to identify with certainty, though probably many of them would be valuable in this country if properly introduced.

Japan had an exhibit remarkable for its extent as well as for its scientific and practical value. The collection was accompanied by a very well written and interesting pamphlet

specially prepared by Mr. F. Goto, the Commissioner for the Imperial Bureau of Forestry, giving many details of the systems of Forest Management in that country, and of the many species which supply its immense consumption of timber. During my recent visit to Japan for the purpose of investigating its forest and timber resources, I became much indebted to the kindness and goodwill of Baron Kiyoura, the Minister of Agriculture, and many of the officials of the Forestry Department, who vied with each other in their efforts to show me all that was best worth seeing, at a time Japan was straining every nerve in prosecuting the war. Of the fine woods of Japan, those of the Keaki (*Zelkova keaki*), the Cryptomeria (*C. Japonica*), the Hinoki (*Cupressus obtusa*), and the Yachidamo (*Fraxinus mandschurica*), which last is only produced in the north island of Hokkaido, seemed to me fit for the finest cabinet-making and interior work, whilst the variety of bamboos, of which a selection was presented to me for the Kew museum, was most extraordinary.

Great Britain was practically unrepresented in this Department, except by a small but interesting exhibit of publications, maps, photographs and working plans sent by the Indian Government Forest Department, and by the large collection of photographs of trees growing in the British Islands shown by the Royal Scottish Arboricultural Society, Mr. C. Richardson, of Stamford, and myself.

In the Fish and Game Department, however, was an extremely well-prepared and well-arranged exhibit by the Marine Biological Association of the United Kingdom, illustrating the different stages in the growth and development of the principal food fishes of the British Islands. This exhibit received the highest possible award, and has, I am happy to say, since been purchased by Mr. James Horlick, of Cowley Manor, Cheltenham, and presented by him to the Fishery Commission of the United States.

H. J. ELWES.

REPORT BY PROFESSOR H. BAUERMAN,

BRITISH JUROR FOR MINES AND METALLURGY.

The objects included in the Official Groups, Nos. 115 to 119, which cover the whole field of Mineral Industry in its widest sense, taking in the discovery and working of mineral deposits, the intermediate processes of concentration and separation of useful from waste minerals and the final treatment by the smelter for the production of metals for commercial and manufacturing use, were for the most part contained in the Palace of Mines and Metallurgy, which covered about nine acres, occupying the south-east corner of the main group of buildings, additional space being provided in the Metal Pavilion and the Mining Gulch, the latter a space of about twenty-eight acres being arranged for the exhibition of full-size machinery in actual operation, such as rope-ways, mining railways, boring plant and the like.

The elaborate official division of the material into classes from Nos. 667 to 719, although convenient for the special work of the International Jurors, is unsuitable for a review of the general results, and more especially as the different classes were unequally represented and do not appear to have been very closely attended to by the exhibitors. Taking a more general view, therefore, it may be said that the contents of the Palace of Mines and Metallurgy could be classified under the three principal heads of—

1. Exhibits by the Federal Government and individual contribution in the United States Section.
2. Collective Exhibits of the different States of the Union.
3. Collective Exhibits from foreign countries.

AMERICAN SECTION.

About two-thirds of the total area was occupied by the domestic, or first and second of these groups, and the remainder by the foreign collections. From this it will be seen that, although the collective far outnumbered the individual exhibits, the latter, taking a few prominent examples, included the units

of greatest importance, such as the display of mining machinery by the Allis-Chalmers Company, that of nickel ore and products by the International Nickel Company, the Bethlehem Iron Company's armour plate and ordnance display, and the Morgan Construction Company's gas-heating furnace and continuous rolling mills. The State exhibits, on the other hand, were mainly collective, such as are generally associated with local museums. In fact, several of the collections had been lent by colleges and similar institutions for the term of the Exhibition. It is difficult, therefore, to present any survey under general heads except in a rather discursive manner.

Coal.—The chief exhibits of interest in connection with the older industry of Anthracite Mining was represented in the Pennsylvania State collection by a model of the different systems of working, adopted in the thick and disturbed seams of the Appalachian region from the ordinary single-stall method worked in flat strata to that of stopping and filling, in a manner similar to that used in mineral veins, where the seams are steeply inclined or vertical. Where the mammoth seam appears at, or is near, the surface the simple method of stripping and excavating the mineral with a steam-shovel is used. The most characteristic feature of the Anthracite region is, however, afforded by the "breaker," a towering structure having a set of toothed crushing rolls at the top with a series of screens for classifying the broken products into sizes diminishing downward, a process which is essential to the successful use of this coal as fuel, as a proper supply of air to the fire-grates can only be obtained when the fragments of fuel are uniform in size. This is attended with considerable waste in small coal, or "culm," which has until comparatively recently been thrown aside or washed back into the mine to fill the exhausted workings; but the adoption of washing machinery for its utilisation is now becoming general. Some interesting sizing and jigging machinery, which has been successfully adopted in the treatment of anthracite waste, was contributed by the American Concentrator Company, which, however, was placed on the eastern external arcade in a somewhat obscure position. The most prominent representative of the bituminous coal industry of Pennsylvania was the Pittsburg Coal Company, a combination owning 85 mines in the Pittsburg district and others in the Hocking Valley, Ohio, with an area of about

110 square miles. This, probably the largest coal-dealing firm in the world, handles an output of over 16,000,000 tons per annum. Their exhibit consisted principally of a model of underground workings by the pillar and stall method in various stages of development, with compressed air coal cutters of the chisel type. Much of the trade is done with the ports on the upper lakes, and elaborate mechanical methods are adopted for loading and discharging the carrying steamers without hand labour. These were illustrated partly by a model of a loading staith and shoot on Lake Erie and in more detail by an elaborately illustrated descriptive pamphlet.

The smokeless steam and gas and coking coals of Western Virginia were illustrated by the Consolidated Fairmont and Somerset Coal Companies of Baltimore in a model adjacent to that of the Pittsburg Company, representing the workings and surface arrangements of a colliery worked from a level with the screening and slack elevating plants for a range of bee-hive coke ovens, on a sufficiently large scale to show the method of underground hauling by compressed air locomotives in action. The block coal of Indiana, corresponding in its non-caking property to the splint coal of Scotland, formed a principal feature in the collection from that State in the form of a black castle of the chessman type built up of this coal, which can be raised in masses comparable to the largest blocks of building stone. It was formerly employed to some extent as blast furnace fuel in some furnaces near Indianapolis, but these works have been abandoned for some time.

The Illinois Coal Field, which furnishes most of the fuel used in St. Louis, was well represented in the State collection by sections of the full thickness of the principal seams; the largest, having a size of 6 feet by 7 and a height of $8\frac{3}{4}$ feet, representing the thickness of the seam, weighed 63 tons, and is said to be the largest single block of coal ever raised. It came from the Divernon mine at Madison, which is the most important mine in the State. The principal seam, averaging 7 feet in thickness, follows the Eastern bank of the Mississippi for about 60 miles, although rather high in ash and sulphur, furnishes one of the cheapest fuel supplies in the world, the mines being rarely above 600 feet deep, and giving a very large output with simple appliances. Striking evidence of the latter point is afforded by the small winding engine by the Crawford

and McCrimmon Company, of Brazil, Indiana, with 14 by 30 inch steam cylinders shown in the Northern Arcade, representing a type which has raised 300,000 tons of coal in ten months. The depth of the mine, however, was less than 80 yards.

Coal-cutting machines, which have been more extensively applied in America than in Europe, were entirely unrepresented, and the show of miners' tools was scanty, being confined to a series of twist drills of well-known patterns in the corner of the South-eastern arcade.

The hard, silvery coke from Connellsville and Western Virginia found numerous exhibitors, but without illustrations of plants or manufacturing details, the ordinary bee-hive oven of the simplest kind being generally used. Retort ovens of the Semet-Solvay and Otto-Hoffmann forms, as modified for American use, were shown in drawings by the American Coal Products Company as carried out at the Lackawanna Steel Company's new works at Buffalo, together with a large series of by-products received from the distillation gases.

The most interesting exhibit in connection with coal was the fuel-testing station of the United States Geological Survey, which has been established for the purpose of determining the technical value of the coals in the region west of the Mississippi. This, besides complete chemical and calorimetric determinations made in a laboratory in the Metal Pavilion, included practical tests on the working scale of the evaporative and fuel values in steam boilers and fuel gas producers, cohesive strength and suitability for briquette and coke-making. The plant including three Steam Boilers, a 350 HP. Allis-Chalmers Steam engine, a 275 HP. Westinghouse Gas Engine, each with its own continuous-current electric generator of 250 kilowatts, a coal-washing plant, a rotating drier for lignites, two briquette machines for large and small size blocks respectively, three small bee-hive coke ovens, and a large gas-producer with scrubber and gas-holder for power gas. The items composing this plant were mostly lent by different American and English makers, the cost of working being met from a special grant by the United States Congress, which, it is hoped, will be continued, as the investigation is likely to require some considerable time for its completion.

Iron Ores.—Representative examples of the more important

iron ore deposits of the United States were to be found distributed through the different State Collections, as for example those of the Mesaba region in that of Minnesota, those of Michigan in the collection of the Houghton School of Mines, the Magnetic ores of Lake Champlain in New York, and so on from other States, but in most instances only in cabinet and museum specimens. Some large masses of the soft red ore of the Clinton formation piled at the feet of the Iron Man of Alabama represented the principal source of supply of the iron industry of the South Atlantic States. There were, however, some noticeable individual exhibits of iron ores, namely, that accompanying the model of the Cleveland Cliffs Ironworks at Marquette which is further noticed below, and the model of the Fayal Iron Mine at Eveleth, Minnesota, which in 1903 produced two million tons of haematite. This is a shallow basin-shaped deposit of soft red ore which was at first worked by stripping the surface, and excavating with a steam shovel; but latterly the more regular method of deep levels with shafts for lifting the ore to the surface has been substituted. In connection with this subject the remarkable model of the harbour of Duluth which formed the central feature of the Minnesota collection deserved notice. This showed the arrangements for loading iron ore and other bulk cargoes with the extreme rapidity rendered necessary by the short duration of the navigating season on the Great Lakes.

Among comparatively undeveloped iron ore those of Utah and Sunrise in Wyoming were noticeable. The latter yield a pure red haematite of 60 to 68 per cent. to the extent of about 2,000 tons per day, which is smelted at South Pueblo, Colorado; while the former are stated to show about 500 million tons of an equally pure magnetite.

Iron Manufacture.—The American Blast Furnace in its latest form was entirely unrepresented except by certain details such as the bronze tuyères and cinder-notch cooler of the Lawrenceville Bronze Company of Pittsburg and the Blast Furnace Cinder car, tipping sideways, worked by steam taken from the locomotive with a hydraulic compressor or brake on one of the trunnions to keep the turning speed within safe limit, sent by Mr. E. A. Weimer of Lebanon, Pennsylvania.

The only complete exhibit of a plant making cast iron was that of the Pioneer Iron Co., in connection with the Cleveland Cliffs Iron Company mentioned above. This was a model of a

furnace at Marquette, Michigan, smelting about 130 tons daily of haematite iron with charcoal from maple wood, which is carbonised on the spot in kilns provided with condensing arrangements for collecting the distillation products, pyroligneous acid, wood alcohol, tar, etc., contained in the gases before using the latter as fuel in the stoves and boilers. About 27,000 tons of crude acetate of lime, and 475,000 gallons of wood alcohol are saved in the year from 640 tons of wood yielding about 20 per cent. of charcoal carbonised per day. About 2,200 square miles of forest from which the best timber has been mostly removed are available to keep up the enormous supply required by the charcoal kilns.

The largest cast iron exhibit was one of an ornamental character, namely, the "Iron Man of Alabama," a colossal statue of a primitive iron worker, 56 feet high, and about the same number of tons weight, intended for decorative use in the Capitol Park at Birmingham, Alabama, after the close of the exhibition.

The best collection of cast iron classified according to use was furnished by Messrs. Rogers Brown & Co., in which foundry qualities were well represented, the series being similar to, but of a less comprehensive character than, that exhibited by the same firm at Paris in 1900. The special American industry of chill cast-iron railway wheels was not represented in the Mines Building, but found its place in the Transportation Building, where the American Car Company of St. Louis, showed a large series of examples of their make which exceeds 800,000 wheels, weighing about a quarter of a million tons per annum. This specially depends upon the use of charcoal pig-iron, which is still obtainable in considerable quantities in the United States.

Malleable cast iron was represented in the exhibit of Mr. A. E. Barber of New York, whose firm has continuously carried on the business since its introduction by Seth Boyden in 1825. This contained full-sized sectional models of the melting and annealing furnaces, besides numerous examples of work in different stages of the process.

Manufactured Iron and Steel.—The largest and most prominent exhibit in the Mines Building was that of the Bethlehem Steel Co., of Pennsylvania, which covered about a quarter of an acre of the central floor space. This included a

large number of heavy forgings for ordnance, marine and large stationary engine uses made from ingots cast under the Whitworth system of consolidation by fluid compression, armour plates and ordnance and steel castings, mostly in actual examples except in the case of the heaviest, which were shown as models. A section of the iron lining for the tunnel under the Hudson River bringing the Pennsylvania Railroad into New York was a prominent object, and a curious series showing the amount of coal and other materials consumed in each stage of the twenty-six operations involved in the making of a large armour plate sufficiently explained the reason for the expensive character of this particular branch of steel-making.

Messrs. Worth Bros. of Coatesville, Pennsylvania, exhibited a very fine series of rolled and flanged plates for boiler work, among them being a $\frac{3}{4}$ -inch plate 46 feet long by 11 feet 10 inches wide, weighing $7\frac{3}{4}$ tons, stated to be the largest boiler plate ever rolled, and another of $\frac{1}{2}$ inch thick and 12 feet 2 inches wide. These were rolled on a mill with a clear width of 12 feet 8 inches recently erected. Tubes for boilers from welded blooms made in the open charcoal fire also appeared in this collection, and specially tough wrought iron for boiler stays, made in the same way, was contributed by the Ewald Iron Co. of Saint Louis. Another remarkably fine series of dished and flanged steel plate work for boilers was sent by the Glasgow Iron Co., of Pottsville, Pennsylvania.

The largest example of welded plate work was placed in the Machinery Building. This was a boiler made of $\frac{3}{4}$ inch steel plate $42\frac{3}{4}$ feet long and 9 feet in diameter, for disintegrating wood pulp with caustic soda at 125 lbs. pressure, sent together with numerous examples of corrugated boiler furnace tubes, by the Continental Iron Works of Brooklyn.

The Morgan Construction Co., of Worcester, Massachusetts, supplied a complete series of illustrations of their method of continuous rod and wire rolling, including full-size sections of automatic heating furnaces for billets, a gas producer with continuous fuel distributor, and complete groups of rod and wire mills, six of the former and eight of the latter, arranged in continuous series together with the flying shear for cutting the rod at any required point during its passage through the mill. This was notable as representing on the working scale one of the newest characteristic devices in American Iron making practice.

The larger items of iron-works machinery, such as blowing engines, rolling mills, etc., were represented on two fine series of photographs contributed by Mr. Julian Kennedy and the Mesta Machine Co., both of Pittsburgh.

The exhibit of the International Nickel Co., of New York, was remarkably complete and well arranged, including examples of the ores both from Canada and New Caledonia, the various intermediate products obtained and the reducing processes and the application of the metal, both in the pure state and in numerous metallic alloys, particularly as machinery and structural steel. The strength and endurance of steel with $3\frac{1}{2}$ to 6 per cent. of nickel was illustrated by examples of rails taken from the horse-shoe curve of the Pennsylvania Railroad where the life of carbon steel rails is measured by months only, and different parts of rolling mills, rolls, pinions, couplings, etc., taken from actual work after rolling different quantities, varying from 22,000 to 300,000 tons of ingots and blooms to finished products. Pure malleable nickel obtained by a new process is also made in considerable quantities, and tubes of this metal are prepared for use in locomotive boilers. The high nickel, 30 to 50 per cent., steel alloys which have received so much attention on the Continent have not, however, as yet been much used in America.

Hadfeld's Manganese Steel, the toughest iron alloy known, was shown in its application to rock crushing and screening machines and similar hard wearing uses by the Taylor Iron and Steel Co., of High Bridge, New Jersey, and to safes and strong rooms by the Manganese Steel Safe Co., of New York. Much ingenuity was shown in the methods adopted by the former firm for building up complex machines in this intractable material which cannot be machined, the different parts being cast with cores or plugs of soft steel in which the seats for the connecting bolts and screws are subsequently bored and finished. Another hard material, Chrome Steel, was represented by a small collection of shoes, dies and other wearing parts of stamp mills contributed by the Chrome Steel Company of New York.

Other Metals.—Although the ores of the principal metals other than iron were well represented in the different State collections, as for example the native copper of Lake Superior in Michigan, the ores of the Copper Queen district in Arizona,

and those of the Butte district in Montana, the details of their metallurgical treatment were either extremely scanty or entirely wanting.

The zinc and lead ores of the Mississippi Valley, however, formed principal features in the collections from Missouri, Kansas and Arkansas in the main building, and in the special Missouri Building in the gulch, which contained an ore-dressing plant as well as a large collection of ores and veinstones. This region, which was originally famous as a lead producer, has now become of principal importance as a source of zinc. The ore, a light coloured blende, nearly pure zinc sulphide, is smelted in a slightly modified form of the Belgium furnace, natural gas being used as fuel, the advantages afforded by that heating agent over coal having transferred the principal centre of production from Lasalle in Illinois to Iola in Kansas, about 400 miles to the south-west.

The Lanyon Zinc Company of Saint Louis had large exhibits of spelter, roofing-sheets and other zinc-smelting and manufacturing products, both in the Mines Building and the Metal Pavilion, and some details of the smelting processes, showing the method of heating the retorts by gas, were contained in an explanatory notice.

The ores of the precious metals were abundantly represented in the mineral collections from the Pacific and Western Mountain States, the most complete and valuable display being that from Colorado, all the more important private collectors of native gold, tellurides and other precious minerals having liberally contributed. Amongst these a case of specimens of the new radium mineral Carnotite formed a special attraction. The most important practical illustration of gold mining and reduction was that contributed by the Black Hills Mining Men's Association of South Dakota. This included a large topographical and geological model of the Black Hills region, and samples of the ores from the principal mines showing the change in character in depth, in the State collection, and in the gulch, a fully-equipped 5-stamp mill and accessory appliances where the Cyanide method of gold extraction was shown in operation, a large supply of ores having been contributed by different Mining Companies in the district to allow the actual working conditions to be as closely reproduced as possible. This was perhaps the best-planned exhibit in the Department.

Ore-dressing Machinery.—The Allis-Chalmers Company, of Chicago, occupied an area of about 4,500 square feet with examples of ore-crushing and dressing machinery of all kinds, including gyratory rock-breakers of the Gates form, Huntington Mills and roller-crushers, steam-hammer and ordinary gravitation stamps, jigging-machines, slime dressing-tables and pans and settlers for the pan amalgamation process, together with a small winding-engine and tube mills for cement-making. This collection was so extensive and well planned that a mere enumeration of its contents would extend to many pages of this report, and therefore it must suffice to say that it presented a complete epitome of the best modern American practice in mechanical preparation of metallic ores. A smaller collection of similar machinery, including a belt-driver Blake rock-breaker, crushing-roller, and a Klein percussion-table, was exhibited by the Arthur Fritsch Company of St. Louis, and the Austin Manufacturing Company of Chicago sent a full set of their gyratory rock and ore-crushers, from the smallest size, weighing about 3 tons, to the largest of nearly 20 tons and capable of breaking 150 to 200 tons to $3\frac{1}{2}$ inch pieces per hour. These machines are largely used for preparing road metal and limestone breaking for cement works as well as for metallic minerals.

Adjacent to the ore-dressing machinery on the west side of the building, the J. G. Leyner Company of Denver exhibited a compound air-compressor and rock-drill, both containing several novel features. The compressor was provided with a method of inter-cooling between the two stages of compression by passing the heated air in a number of parallel streams through tubes in the cooling water-jacket, and the drill was perforated with a water channel for continuously removing the dust formed in boring. This was the only group of machines shown in action in the Mines Building, and their construction was fully explained by full-sized sections and a remarkably well-illustrated descriptive pamphlet.

Percussive and other drills for oil-wells and prospecting purposes were for the most part to be found in the gulch and in the outer arcade in the south-east corner of the building. In the latter were placed the contributions of the American Diamond Rock-Drill Company, comprising examples of drilling-machines of different capacities and cover for bore-holes up to

22½ inches in diameter. In the gulch some of the methods for well-boring were shown in action.

Non-Metallic Minerals.—The clay industries of the United States, which are now of greater importance than gold and silver collectively, occupied a large space in the south-east corner of the building, and included bricks, pipes, terra-cotta and glazed and other clay wares in great variety, many of which belonged more properly to the departments of building construction and ceramics. A more special interest, however, attached to the display of fire bricks, glass-melting pots, gas retorts, etc., contributed by the Missouri Fire Brick Company, the Mississippi Glass Company, the Laclede Fire Brick Company and other St. Louis manufacturers. The raw materials of this industry are a grey clay occurring at the bottom of the coal measures over an area of 170 square miles, and a very refractory non-plastic variety of China clay known as flint clay, found in irregular deposits in Carboniferous or Silurian Limestones. By combining these materials in different proportions the fire-resisting properties of the products may be varied within wide limits, and still more refractory ones may be obtained, by the addition of alumina in the form of bauxite to the flint clay. Examples of fire bricks made by the latter method, containing 70 per cent. of alumina, were shown by the Laclede Fire Brick Company in connection with their large gas works exhibit in the Manufactures Building.

A new method of producing sulphur shown in the Louisiana collection was perhaps the greatest novelty in Mining methods to be found in the Exhibition. The deposit, a sandy limestone containing native sulphur, occurring at a depth of about 600 feet, which could not be reached by ordinary sinking on account of the great thickness of an overlying quicksand, has been reached by bore-holes, down which superheated water is forced to the rock. The heat melts the sulphur in the immediate vicinity, which collects in the bore-hole, and together with the water is blown out through a smaller central tube to the surface by compressed air, where it collects and solidifies in shallow temporary tanks enclosed by boards; the yield from the holes varies from 12 to 42 tons per hour, and the daily yield at the end of 1903 was about 1,000 tons, the sulphur being of a high degree of purity. About 150 barrels of crude mineral oil burnt under the boilers is sufficient for daily output of 520 tons of sulphur.

The petroleum industry, while represented as regards individual sources of supply in the different State collections, found its principal exponent in the large collection of the Standard Oil Company arranged by Dr. Day of the United States Geological Survey. This in character and arrangement recalled the same Company's exhibit at Paris in 1900, though on a somewhat smaller scale, and contained a full series of products obtained in the refining of natural mineral oils, and a large scale section of the Appalachian oil basin compiled from the records of innumerable borings by Mr. Oliphant of Oil City, Pennsylvania.

In the California collection an architectural trophy made of a rock containing lithia mica and pink tourmaline formed the central object. This material, which a few years ago was only of mineralogical interest, has become commercially important as a source of lithia for pharmaceutical purposes; nearly 2,500 tons, valued at £15,000, have been exported to Germany during the past five years. Another important Californian industry was represented by the Pacific Coast Borax Company, who exhibited borax and other products obtained from refining the crude borax deposits in the Death Valley of the Mohave desert, a region which is also said to contain nitrate of soda deposits on a larger scale than those of Chili. These, however, have not yet been worked owing to the absence of railway facilities.

Gems and ornamental stones were well represented in the different State collections, notably in Colorado, Montana, New Mexico and North Carolina, but more particularly in the large exhibit of Messrs. Tiffany & Co., of New York, made by Dr. G. F. Kunz, which formed a principal attraction in the Mines Building. A special novelty in this was a new transparent variety of spodumene, varying in colour between amethyst and pink topaz, discovered at Pala, California, in 1903, which under the name of Kunzite is now largely used in jewellery work. Adjoining this was a large collection of Radio-active minerals formed by Dr. Kunz for the United States Geological Survey.

The Board of Trade of Niagara Falls, New York, exhibited, in connection with a large model of the Niagara Water Power Works, examples of the different products obtained by the utilisation of electric energy derived from the Falls; principal among these was the Carborundum Company's collection of carborundum and other abrasive materials, artificial graphite

made from coke, and silicon of 97 per cent. purity, all being products of the Acheson Electric Furnace. Artificial emery is also made by melting bauxite on the electric arc. A large sample of this product made by the Norton Co., under the name of Alundum, appeared in connection with the collection of Arkansas and other hone stone shown by the Pike Manufacturing Company of New Hampshire. The Pittsburg Aluminium Company's exhibit of aluminium made at Niagara occupied a large space in the Metal Pavilion, a principal feature of interest being the method adopted for erecting and joining the large aluminium conductors which have there taken the place of copper for the distribution of heavy electric currents.

BRITISH SECTION.

In the British Section the principal portion of the space was occupied by the official contributions of the Home Office and Board of Education. The first of these included a collection of minerals illustrating the products of the principal mines of the United Kingdom supplied by about 200 different contributors, and arranged by Messrs. Ware and Williams. A complete set of the statistical publications of the Mining Department of the Home Office and a series of photographs of underground workings, mostly by Mr. Williams, those relating to Metal Mines being the work of Mr. J. C. Burrows. Mr. H. W. Hughes's photographs of South Staffordshire coal mining formed an independent exhibit. The Board of Education contributed a large and detailed series of maps showing the present state of the Geological Survey in the three kingdoms, together with some new models of the Isle of Purbeck and the Assynt district in Scotland, and the well known Geological model of London from the Jermyn Street Museum. The Metallurgical exhibits were confined to two excellent collections of best Yorkshire Iron by the Monk Bridge and Farnley Companies of Leeds, and others representing Shropshire and Derbyshire by the Lilleshall and Sheepbridge Companies; the Lilleshall Company also sent drawings of blowing engines and other large iron making machinery. Marbles and other ornamental and building stones formed principal features in the collection of Irish Mineral products sent by the Department of Agriculture and Technical Instruction for Ireland; and two interesting examples of the re-opening of quarries of historical renown were furnished by the Harehope

Mining Co., of Durham, and the Verde Antico Marble Co., the former with the dark-coloured Frosterly Marble, and the latter with the Verde Antico Breccia of Thessaly from the quarries discovered by Mr. William Brindley.

India.

The Geological Survey of India sent some illustrations of their maps and publications; and samples of magnesite and manganese ores from Southern India were contributed by Messrs. Macfadyen & Co., who have developed an important business in the latter minerals.

Ceylon.

There was a small collection of minerals from Ceylon, illustrating the occurrence of Graphite, the most important mineral of the Island, amongst them being included a model of the deposit in the principal mine.

Canada.

The Canadian collection was one of the largest and best arranged in the Mines Building. It formed part of the new economic mineral museum at Ottawa, intended to take the place of that of the Geological Survey originally formed by the late Sir W. E. Logan, and continued by succeeding heads of the Department. It contained examples of all the mineral products of the dominion from the Atlantic to the Pacific, including coal from Nova Scotia, the Rocky Mountains and Vancouver Island, gold from Nova Scotia, British Columbia and the Klondike regions, nickel ores from Sudbury and apatite asbestos, mica and corundum from the older crystalline rocks of Ontario. The mica occurs in masses of great size, one of the crystals weighing 1,200 lbs. The Dominion claims to be the largest producer of this class of minerals, 90 per cent. of the asbestos, and 85 per cent. of the corundum, besides more than half of the nickel produced in the world being of Canadian origin.

FOREIGN SECTIONS.

The contributions of foreign countries varied very considerably in character, Japan, Mexico and Brazil having sent very complete collections and illustrations of their mineral

resources, and the first of these contained in addition several interesting models of mining and metallurgical works.

Mexico.

In the Mexican collection, which formed part of the permanent Museum of Economic Mineralogy in the city of Mexico, gold and silver ores and their associated minerals were largely represented, including plans of the Real del Monte and other famous mines. Copper mining, which is of more recent date, had as principal representatives the Boleo Company of Lower California, the Cananea Company of Sónora and the Tezuitlan Company of Pueblo, all contributing ores and furnace products, and the latter some excellent transparent photographs of the smelting works. The small iron industry of Mexico was represented by the Monterrey Iron and Steel Co., and Mr. R. Honey of Zimapan, who sent cases containing small specimens of twisted bars and other sections showing the excellent quality of the metal produced. The translucent variegated marble known as Mexican onyx was sent from a large number of localities. The good work being done by the Geological Survey of Mexico, which has not long been established, was evidenced by the large number of maps already completed.

Argentine Republic.

The Argentine collection illustrated numerous gold, silver, and copper ore deposits which are mostly waiting development. Onyx marble also occurs very largely in that country.

Brazil.

The Brazilian court contained a large display of minerals, but the arrangement being mainly topographical, the collections being grouped according to localities, the general effect was not as striking as it might have been. The new manganese industry of Minas Geraes was, however, well in evidence, including samples from Miguel Burnier and from a new locality, Morro de Mina, where five million tons of ore are stated to be exposed above the railway level. Rock crystal for optical and ornamental purposes, zircon and other gems, and monazite-sand from the shore near Bahia were other notable objects. The famous old gold mine of Saint John del Rey was represented

by an exceedingly fine plan and section with samples of the ore from the deep workings.

Peru.

Peru had a small collection of minerals, the principal item of interest being the copper ores from Cerro de Pasco, which have been developed in the deeper levels of the old silver mines of that district, which is now accessible by the railway from Callao across the Oroya Pass.

Japan.

The Japanese collection was a remarkably full and complete display of the mineral resources of the Empire and of the work done in their study and description by the Imperial Mining and Geological Departments. The principal products were coal, copper and sulphur, all of which were fully represented. The most prominent objects in the court were three models, the first being that of the Manda Coal Pit in a colliery raising about 2,000 tons of coal daily and having an exceptionally heavy pumping plant. This was fully equipped with working models of the winding and pumping engines and other mechanical appliances arranged to work by means of an electro-motor. The second model gave the details of the Takishima coal basin in Nagasaki Harbour, which has been almost entirely developed by submarine workings, only a few of the highest points appearing above the sea-level. The third model represented the Kosaki copper smelting and refining works. The Japanese interest in mineralogical study was evidenced by a remarkably fine collection of the minerals of the Empire lent by a private owner.

France.

In the French collection the principal feature of interest was a model of the Hérault electric steel furnace, which has been successfully used at Froges for making steel from pig-iron and malleable scrap, with heat derived from electric resistance instead of fuel gas. It is similar in form to the ordinary Hérault electric furnace used for making aluminium, with the addition of Wellman rockers for tilting the furnace when pouring out the charge. The capacity of a 7 ton furnace is stated to be 150 tons of steel per week. The process has recently been fully described by Mr. F. W. Harbord in a report to the Government of Canada. French coal mining is represented by a model

of the Loire coalfield, made up by sections drawn upon glass plates, numerous highly finished drawings of the surface plant, and detail of several of the larger collieries in the Northern Coalfield, and a full-sized model of the system of safety supports adopted in the mines of the Auchy and Courrières Company. Mr. F. Laur sent a series of samples illustrating his studies on the composition of the bauxite or aluminium ores of the South of France, but unfortunately these not being described or labelled did not receive the attention they deserved. The geological map of the French Alps, which has occupied a large body of observers for several years, formed a prominent object in the collection.

Germany.

The German Court, though of considerable size, was but thinly occupied, the principal objects being the fine sectional model of the Westphalian coalfield, that of the surface arrangements of the Shamrock III. and IV. pits of the Hibernia Coal Mining Co., and of the colony of workmen's dwellings of the Gelsenkirchen Company, all of which had been previously seen at Dusseldorf in 1902. The principal technical exhibit was one of safety lamps, which includes examples of every kind of lamp used underground, whether for lighting or gas-testing purposes, and cleaning and repairing plant and tools by Messrs. Friedman and Wolf of Zwickau, and a large collection of porcelain for laboratories and chemical works was sent by the Berlin Porcelain Works. Apart from these the principal objects were mainly publications dealing with workmen's houses and other social and economic questions, and a full series of maps and models sent by the Prussian Geological Survey. A large proportion of the wall-space was devoted to a collection of ornamental posting bills for theatrical and other advertisements not connected with the objects of the Department.

Italy.

The Italian Collection, arranged by the Royal Corps of Mining Engineers at Rome, was in principle confined to two specialities, sulphur and ornamental marbles, both of which were very thoroughly illustrated. The Geological Survey of Italy also sent a full series of publications, including a general index map and details of particular districts on larger scales, among the latter being the New Geological Atlas of the Island of Elba. The new blast furnaces and coke ovens

at Porto Ferrajo in that island recently completed were represented by a large series of photographic views, and an interesting historical relic was the original Sommeillier rock-drill used in the Mont Cenis tunnel between 1860-1870.

GENERAL REMARKS.

From what has been stated in the preceding pages it will be gathered that the Exhibition in the groups under review was essentially one of mineral products, and as such was fairly representative of the resources of the United States and of some of the principal foreign contributors, such as Canada, Japan and Brazil, but as regards plant and processes, whether in Mining and Metallurgy, the representation was too fragmentary to allow of any general conclusions being formulated, except perhaps that the subject is getting so large, that bringing together general collections for temporary purposes is becoming so difficult that we may expect to find closer restriction, whether to particular localities or special objects, as characteristic of the great Exhibitions of the future.

H. BAUERMAN.

REPORT BY CAPTAIN P. H. ATKIN,
BRITISH JUROR FOR HUNTING EQUIPMENT.

It should be explained at the outset that the word "hunting" is used in the United States to describe chasing any wild animals, large or small, with a view to shooting or catching them. In England it may be defined to be the pursuit of certain wild animals by means of a pack of hounds following by scent.

I propose to prepare this report with a view to extracting for the benefit of those who were not present at the Fair, as much useful information as possible from among the objects exhibited in this group. The report does not aim at being an inventory of the Exhibits, nor an expression of the opinion on their relative merits, but it is confined to those objects illustrating some principle in Hunting Equipment which may serve for the advancement of the sportsman's skill in future, or be a record of some progress in the past. I have looked for an exhibit which might be regarded as a discovery, or for any which tends to increase human power, or to develop it more effectually.

BRITISH SECTION.

Attention is first given to the section of Great Britain, where was exhibited an exceedingly fine collection of sporting, single and double-barrelled guns and rifles of the highest quality and finish, comprising guns of various weights for field, trap and wild-fowl shooting, made on hammerless and ejector systems, several high velocity cordite rifles of various calibres, and the latest developments in Express rifles for small or large game. Whatever criticisms may have been passed on other divisions of the British representation, this section cannot but be considered as one of the best representative collections which the Royal Commission has brought together, and the manner of its installation and the general impression it made upon the jurors and the public are worthy of warm approbation, and in this connection especial reference should be made to the very

handsome show-case provided by Messrs. H. J. Hussey, Ltd., of New Bond Street, for their display. The enterprise of the British gunmakers is all the more commendable inasmuch as with a Customs tariff of 6s. to 25s. on each article and 35 per cent. *ad valorem* duty, the market for arms of such fine materials, unsurpassed workmanship and general excellence in finish as the British sporting guns undoubtedly possess, is necessarily most rigidly limited to sportsmen of large wealth. Ten firms contributed their productions, and of these three received Grand Prizes, one a Gold Medal, and five Silver Medals, while one was *Hors Concours*. In proof of the very high regard in which the British guns were held, it is convincing to note that the only other Grand Prizes awarded were two each to France and Belgium and one to the United States.

This is not the place to discuss the comparative values of British gunsmiths, but it is not amiss to draw attention to an ingenious apparatus for a standard method of testing sporting cartridges included in the exhibit of the Webley and Scott Revolver and Arms Company. At the expense of the *Field* newspaper, this was designed by a committee of experts for the purpose of taking from the firing of a single cartridge simultaneous records on well-defined points. The *Field* Pressure Pendulum Gun, as it is named, was exhibited as the most modern and scientific method for getting the pressures of the numerous compounds used in sporting guns and rifles. So many new gunpowders are being placed upon the market that it has become absolutely necessary that these should be tested to show their pressures, so that gunsmiths and sportsmen should know to what limit their rifles are likely to be safe. The old-fashioned method of testing powders at the proof-houses is rapidly dying out, and it is not improbable that in future tests of powders the principle of this gun will be the best method for testing their velocities and recoil. A full account of the action and capabilities of this gun is given in the British Official Catalogue for this Group.

FOREIGN SECTIONS.

Turning to the Foreign contributions, a deeply interesting one was a plan of the Imperial Wild-duck Preserve at Shinham, Japan. This is managed by the Board of Sports and Games of the Imperial Household, and the object of the sport is to allure

wild ducks into decoy canals, and then by drawing nets along the bank of the canals catch the birds in the nets, as they are swimming in the canal. In former days wild duck fowling in Japan was done entirely by hawks, but now falconry is only resorted to in order to catch those birds which escape, and which would, if allowed to return to their flock, seriously disturb them for future sport. I found that carefully trained goshawks, sparrow-hawks and peregrines were usually employed for this purpose. The arrangement of the preserve covering 30 acres was very instructive. Protective embankments—planted with shrubs and bamboos to screen off the scent and voices of the fowlers; fowling embankments—similar screens to separate the different decoy canals; small ambushes or watch points—like small sentry boxes, from the back of which millet is thrown into troughs as a bait for the duck; decoy canals—running from the duck pond in a curved form to the watch points, all showed the high development of this ancient and aristocratic outdoor pastime. The description of it and of the training of hawks for the sport caused much comment among sportsmen at St. Louis, and it deservedly secured a Grand Prize.

In the German section was another distinctive exhibit—the Luger Automatic Repeating Pistol, modelled after the Maxim Gun, using smokeless powder, and claiming to be capable of firing over 100 shots per minute. The magazines are interchangeable, easily thrown out and inserted, and contain eight cartridges. Nine shots without interruption can therefore be fired in less than five seconds without changing the magazine, and a series of tests by the United States Ordnance Department produced satisfactory results.

Good collections from the United States, France and Belgium were installed, but I have no notes or recollection of any special features of these exhibits, nor did any remarkable novelty impress itself upon the Jury.

Respecting the *personnel* of the Jury, their first meeting was held on September 2nd when, at the organization, Mr. Milward Adams, of Chicago, was elected President, myself Vice-President, and Mr. Frank Remsen, of New Jersey, Secretary, the other members being Professor Ichijiro Itani, of Japan, the Hon. Seth Cobb, of Missouri, M. Mimard, of France, Commander Morel, of Belgium, Mr. Burgen, of New York, and Dr. Tarleton

H. Bean, Chief of the Department of Fish and Game. The Jury being so small did all their work together and made their examinations of the various competitors after despatching an intimation to the respective exhibitors of their intention. By this plan many of the vexations and loss of time caused by the absence of the exhibitors when juries pay their visits, were happily avoided. A careful system of marking for award was laid down in the rules for the juries, and, with few exceptions, I am glad to say that very little discussion arose in order to arrive, in most cases, at a unanimous decision. Throughout the deliberations of the Jury the greatest punctuality was observed, and the method, order, and business-like way of proceeding struck me as giving considerably additional weight to their eventual findings. The Jury made their report on the 15th September.

GENERAL REMARKS.

In conclusion, it may be useful to add that when considering some foreign exhibits I observed that, as a rule, juries do not like to make high awards to manufacturers whom they suspect of making up work for the Exhibition of superior finish and grade to that which it is probable they make in the ordinary course of their business. Evidence that a firm employs a large number of men, has been established for a long time, and has shown progress, is a great element in the judgment of the Jury on the article exhibited, and therefore these are important points to be borne in mind when manufacturers propose to take part in an International Exhibition.

P. H. ATKIN.

LIST OF AWARDS
TO
BRITISH EXHIBITORS AND COLLABORATORS.

N.B.—For the recommendations of the Jury respecting the Departments of Education, Art and Social Economy, see p. 202.

GRAND PRIZES.

DEPARTMENT OF LIBERAL ARTS.

GROUP 15.

Henry Graves & Company, Limited.
For Engravings, Mezzotints and Etchings.

GROUP 16.

Walter Benington,
A. Horsley Hinton,
Alexander Keighley.
For Pictorial Photographs from Nature.

Captain Sir W. de W. Abney, K.C.B., F.R.S.
For Alpine and Scientific Photographs.

The Royal Observatory.
For Solar and Stellar Photographs.

The Royal Photographic Society.
For the work of the Society in connection with the British
Exhibit of Scientific Photographs.

The Solar Physics Observatory.
For Solar and Stellar Photographs and Apparatus for Solar
Photography.

Sir J. Benjamin Stone, M.P.
For Collection of Photographs illustrative of the National
History of Great Britain.

GROUP 17.

The British Royal Commission.

For Collective Exhibit of Books and Music contributed by the following :—

George Allen.

The Art & Book Company.

The Art Reproduction Company, Limited.

Augener & Company.

B. T. Batsford.

George Bell & Sons.

Adam & Charles Black.

The British & Foreign Bible Society.

Brumby & Clarke, Limited.

The Cambridge University Press (C. J. Clay & Sons).

Cassell & Company, Limited.

W. & R. Chambers, Limited.

Chatto & Windus.

The Chiswick Press (Chas. Whittingham & Company).

Archibald Constable & Company, Limited.

T. & A. Constable.

J. M. Dent & Company.

Duckworth & Company.

Enoch & Sons.

Gay & Bird.

Patrick Geddes & Colleagues.

William Heinemann.

John Hogg.

Arthur Lee Humphreys.

T. C. & E. C. Jack.

The Leadenhall Press, Limited.

Longmans, Green & Company.

Sampson Low, Marston & Company, Limited.

James MacLehose & Sons.

Macmillan & Company, Limited.

Elkin Matthews.

Methuen & Company.

Frank Murray.

John Murray.

George Newnes, Limited.

Novello & Company, Limited.

Oliphant, Anderson & Ferrier.
 George E. Over.
 The Oxford University Press.
 The Rationalist Press Association.
 Lovell Reeve & Company.
 Grant Richards.
 George Routledge & Sons, Limited.
 The Savile Publishing Company, Limited.
 Seeley & Company.
 Smith, Elder & Company.
 Henry Sotheran & Company.
 Edward Stanford.
 Swan, Sonnenschein & Company, Limited.
 The Trustees of the British Museum.
 T. Fisher Unwin.

The British Royal Commission.

For Collective Exhibit of Book-Bindings contributed by the following:—

Leighton, Son & Hodge.
 James MacLehose & Sons.
 The Oxford University Press.
 Robert Riviere & Son.

J. Zaehnsdorf.

For Decorated Book-Binding and half-bindings for public libraries.

GROUP 18.

The Board of Agriculture and Fisheries, Ordnance Survey of Great Britain and Ireland.

For Collection of Maps and Plans, illustrative of the work of the Ordnance Survey.

The Royal Geographical Society.

For Collection of Maps recently published by the Society, and for its work in the extension of geographical knowledge.

The Hydrographical Department of the Admiralty.

For Collection of Charts and Instruments, illustrative of the work of the Hydrographical Department.

The Palestine Exploration Fund.

For Collection of Maps, Raised Maps, Copies of Inscriptions, etc., illustrative of the work of exploration carried on by the Society in Palestine.

The Survey of India Department.

For Collection of Maps, etc., illustrative of the work of the Survey of India.

John Bartholomew & Company.

For Collection of Maps and Atlases.

GROUP 19.

Sir Howard Grubb.

For New Type of Electrically-Driven Equatorial Telescope ;
Surveying and Geodetical Instruments and Gun-sights.

The Cambridge Scientific Instrument Company.

For Scientific Instruments.

The Royal Mint.

For Collection of the Great Seals of England ; British
Naval and Military Medals ; Life-Saving Medals ; Cur-
rent Coins of the British Empire.

GROUP 20.

The Wellcome Physiological Research Laboratories.

For Exhibit illustrating the work of the Laboratories in
Physiological Research.

Burroughs, Wellcome & Company.

For Medicine Chests, Medical Equipments, etc.

GROUP 21.

Besson & Company, Limited.

For Band Instruments.

GROUP 23.

Low Temperature Research Exhibit of the British Royal
Commission.

For Low Temperature Exhibit, including the Liquefaction
of Hydrogen Gas.

The British Cyanides Company, Limited.

For Cyanides and Prussiates for Gold Extraction, Electro-
plating, etc.

Burroughs, Wellcome & Company.

For Apparatus, Chemicals, Galenicals, Equipments, etc.,
relating to Medicine, Microscopy, Pharmacy, Photo-
graphy, etc.

Edward Cook & Company, Limited.

For Soaps of all descriptions.

Joseph Crosfield & Sons, Limited.

For Alkali Products—Silicates, Soaps, Glycerine, Perfumes for Soaps, etc.

Doulton & Company, Limited.

For Stoneware Chemical Apparatus.

Evans, Sons, Lescher & Webb, Limited.

For Chemical and Pharmaceutical Preparations; Lanoline and Preparations.

J. C. & J. Field, Limited.

For raw and finished Waxes, Candles, Soaps, Perfumery, etc.

The Gas Light & Coke Company.

For Derivatives of Coal-Gas, Tar and Liquors, including those employed in the Colour, Manure, Cyanide, Explosives and Timber-Preserving Industries.

Hopkin & Williams, Limited, and

Howards & Sons, Limited.

For Pure Chemicals for Laboratory and Industrial use, and Pure Pharmaceutical Chemicals.

Levinstein, Limited.

For Coal Tar Colours and primary and intermediate products for their production.

Birmingham Metal and Munitions Company, Limited, and

Nobel's Explosives Company, Limited.

For Smokeless High Explosives in their general application to Small Arms, Military and Naval Ammunition, Primers and Fuses.

Price's Patent Candle Company, Limited.

For Paraffin, Stearin, Stearo-Paraffin Candles; Night Lights; Toilet Soaps; Glycerine; Lubricating Oils.

Sir William Ramsay, K.C.B., D.Sc., LL.D., F.R.S.

For Vacuum Tubes filled with the following Gases of the atmosphere:—Helium, Neon, Argon, Krypton, Xenon.

Peter Spence & Sons, Limited.

For Alums and other Aluminous Compounds, and Titanium Compounds.

The United Alkali Company, Limited.

For Comprehensive Exhibit of Products relating to the Alkali Industry.

GROUP 26.

The Trinity House.

For Historical Collection of Models of Lighthouses and Lightships ; Lighthouse Apparatus and Ancient Charts.

The Commissioners of Irish Lights.

For Models of Vessels for the Coast Lighting Service.

William Simons & Company, Limited.

For Models and Photographs of Dredgers and Ferry Steamers.

The Secretary of State for War.

For Plans and Photographs of Barracks and other Military Buildings, and for Plans issued by the Topographical Section of the Intelligence Division of the War Office.

Ransomes & Rapier, Limited.

For Models of "Stoney" Sluices for the River Clyde, and Photographs of the Sluices and Lock Gates in connection with the Great Dam at Assuan on the River Nile.

John Aird & Company.

For Model and Photographs of the Assuan Dam on the Nile.

James Mansergh & Sons.

For Model, Maps and Photographs illustrative of the City of Birmingham Water Supply.

The Public Works Department of India.

For Plans and Photographs illustrative of Canal Construction in India.

The Trustees of the Clyde Navigation.

For Model, Plan and Photographs illustrative of the work carried out for the improvement of the Navigation of the Clyde.

The River Wear Commissioners.

For Model of Sunderland Docks and Harbour, and Models of Cranes and Dredgers.

The Dublin Port and Docks Board.

For Plans, Charts and Photographs illustrative of the work carried out for the improvement of the Port of Dublin.

The Mersey Docks & Harbour Board.

For Views and Photographs illustrative of the Liverpool and Birkenhead Docks.

GROUP 27.

Ernest George & Yeates.

For Plans of the British Royal Pavilion.

DEPARTMENT OF MANUFACTURES.

GROUP 30.

F. P. Bhumgara & Company.

For East Indian Goldsmiths' and Silversmiths' Ware.

GROUP 34.

The Aberdeen Comb Works Company, Limited.

For Combs and other articles, made of real and imitation tortoiseshell and horn.

GROUP 35.

Burroughs, Wellcome & Company.

For Travelling Equipments.

The Singer Manufacturing Company.

For Sewing Machines for stitching rubber belting.

GROUP 37.

George Trollope & Sons.

For Decorated Interiors, illustrative of Rooms of the Elizabethan, Queen Anne and Georgian epochs.

Waring & Gillow, Limited.

For a Pavilion enclosing Suites of Decorated and Furnished Apartments, illustrating the adaptation of historic design in decoration to modern requirements, and for decorative Ship-fitting.

GROUP 38.

F. P. Bhumgara & Company.

For East Indian Furniture.

William Birch, Limited.

For Drawing-room, Dining-room and Bed-room Furniture.

Ch. Mellier & Company.

For Decorative Furniture.

George Trollope & Sons.

For Furniture illustrative of various historical periods in England.

Waring & Gillow, Limited.

For Furniture illustrative of the adaptation of historic design to modern requirements.

GROUP 43.

The Greenwich Inlaid Linoleum (Fredk. Walton's New Patents) Company, Limited.

For Linoleum.

GROUP 44.

The Singer Manufacturing Company.

For Sewing Machines used for Upholsterers' Decorations.

GROUP 45.

Mintons, Limited.

For Decorated China.

W. Howson Taylor.

For Ruskin Pottery.

Doulton & Company, Limited.

For Objects in Decorated Stoneware and Faience; China Vases, Fine China and Earthenware.

Wengers, Limited.

For Chemicals, Potters' Colours, and articles used in the manufacture of earthenware, porcelain, enamel iron and glass industries.

GROUP 50.

Platt Brothers & Company, Limited.

For Machinery and Apparatus used in preparing and spinning Textile Materials.

GROUP 55.

John S. Brown & Sons.

For Damasks, Linens and Cambrics.

William Liddell & Company, Limited.

For Damasks and Linens.

GROUP 57.

Grout & Company, Limited.

For Colour Printed Crêpes de Chine and other crêpes.

GROUP 58.

Miss Audrey Trevelyan.

For Evening Dress, with train of Devonshire pillow-made guipure and *appliqué* lace on net, and for Devonshire lace.

Haywards.

For Honiton, Devonshire, Limerick, and other Irish laces and Irish crochet work.

The Royal School of Art Needlework (London).

For Embroideries.

F. P. Bhungara & Company.

For East Indian Embroideries.

GROUP 61.

J. R. Gaunt & Sons, Limited.

For Buttons, Buckles, Clasps, etc.

DEPARTMENT OF MACHINERY.

GROUP 62.

John Fowler & Company (Leeds), Limited.

For Class B, 6 Compound Spring-mounted Special Road Locomotive Engines, and Traction Wagons.

GROUP 64.

Davidson & Company, Limited.

For Sirocco Centrifugal and Propeller Fans; Centrifugal Pumps, and Air Cooler.

DEPARTMENT OF ELECTRICITY.

GROUP 70.

The General Post Office.

For Historical Collection of Telegraphic Instruments.

GROUP 71.

The Cambridge Scientific Instrument Company, Limited.

For Oscillographs, Resistance Thermometers, and other Electrical Instruments.

Nalder Brothers & Company.

For Instruments for Electrical measurement, and other
Electrical Apparatus.

DEPARTMENT OF TRANSPORTATION.

GROUP 74.

The London & North-Western Railway Company.

For Exhibit comprising the Queen Adelaide Railway
Carriage; Specimens of Permanent Way; Models of the
King's Carriage and Sleeping Car; Models; Photographs.

GROUP 75.

The Cunard Steamship Company, Limited.

For Historical Collection of Models of Steamers of the
Cunard Line.

DEPARTMENT OF AGRICULTURE.

GROUP 80.

The United Alkali Company, Limited.

For Artificial Manures.

GROUP 83.

The Rothamsted Experimental Station (Lawes Agricultural
Trust).

For Photographs, Diagrams and Specimens, illustrative of
the work of the Rothamsted Experimental Station.

GROUP 84.

Joseph Crosfield & Sons, Limited.

For "Verberine," Palm Butter, etc.

GROUP 86.

Joseph Baker & Sons, Limited.

For Ovens and Baking Machinery, Confectionery and Ice
Cream Machinery, Chocolate Machinery, etc.

GROUP 90.

J. A. Sharwood & Company, Limited.

For the "White Label" Worcestershire Sauce.

Joseph Edmunds.

For Curry Powders, Chutneys, Sauces, etc.

A. Boake, Roberts & Company, Limited.

For Chemicals for Sugar Refining, etc.

GROUP 93.

John Dewar & Sons, Limited.

For Scotch Whiskies.

The "Old Bushmills" Distillery Company, Limited.

For Irish Whiskies.

Robert Forrest & Company,

For Scotch Whiskies.

GROUP 95.

The Wellcome Chemical Research Laboratories.

For Exhibit illustrating researches with regard to the constituents of Essential Oils.

DEPARTMENT OF HORTICULTURE.

GROUP 105.

The Board of Agriculture and Fisheries.

For Maps and Photographs of the Royal Botanic Gardens,
Kew.

The Royal Horticultural Society.

For the Publications of the Society.

The British Royal Commission.

For the Garden of the British Royal Pavilion.

GROUP 108.

William Cutbush & Son.

For collection of Clipped Trees, Box and Yew, and
Collection of Ivies.

Sutton & Sons.

For Collection of Bulbous and Annual Flowers.

DEPARTMENT OF MINES AND METALLURGY.

GROUP 116.

The Home Office (Mining Department).

For Collective Exhibit relating to British Mining during the last thirty years, including samples of Coal and other Minerals, Maps, Diagrams and Photographs.

The Department of Agriculture and Technical Instruction for Ireland.

For Collection of Irish Minerals and Building Materials.

GROUP 117.

The Geological Survey of India.

For Maps and Publications respecting the Geological Survey of India.

GROUP 118.

The Birmingham Metal and Munitions Company, Limited.

For Metal Cartridges and Projectiles for land and sea service, and for sporting purposes.

The Farnley Iron Company, Limited.

For Specimens of "Best Yorkshire" Farnley Iron, also samples of the ores and fuel used.

The Monk Bridge Iron and Steel Company, Limited.

For Exhibit of Manufactured Steel and Yorkshire Iron.

GROUP 119.

The Iron and Steel Institute.

For Illustrations and Publications showing the work of the Institute.

The Geological Survey of India.

For the Memoirs and other Publications of the Geological Survey.

DEPARTMENT OF FISH AND GAME.

GROUP 120.

W. W. Greener.

For Sporting Guns and Rifles.

Holland & Holland, Limited.

For Sporting Guns and Rifles, and for Gun-cases.

The Webley and Scott Revolver and Arms Company, Limited.
For Sporting Guns and Rifles.

GROUP 122.

The Marine Biological Association of the United Kingdom.
For Exhibit to illustrate different stages in the growth and development of some of the principal food fishes, and containing examples of the more important shell-fish which serve as human food in the British Isles.

DEPARTMENT OF ANTHROPOLOGY.

GROUP 128.

The Cretan Exploration Fund.
For Exhibit of the work of the Cretan Exploration Fund, as illustrative of the history of Mankind.

The Egypt Exploration Fund.
For Exhibit of the work of the Egypt Exploration Fund, as illustrative of the history of Mankind.

The Palestine Exploration Fund.
For Exhibit of the work of the Palestine Exploration Fund, as illustrative of the history of Mankind.

GOLD MEDALS.

DEPARTMENT OF LIBERAL ARTS.

GROUP 15.

The Fine Art Society.
P. & D. Colnaghi & Company.
For Mezzotints, Etchings, etc.

GROUP 16.

Ernest R. Ashton.
Carine Cadby.

Archibald Cochrane.

Reginald Craigie.

George Davison.

Frederick H. Evans.

W. T. Greatbatch.

Karl Greger.

Frederick Hollyer.

Charles Job.

Charles Moss.

For Pictorial Photographs from Nature.

R. B. Lodge.

For Photographs of Birds.

Arthur C. Banfield.

For Photographs illustrative of the history of a Splash.

Newton & Company.

For Photographs of Flying Bullets, taken by Professor C. Vernon Boys, F.R.S., and for lantern slides.

Edgar Senior.

For Photomicrographs.

Dr. Copeland.

For Solar and Stellar Photographs, and Photographs of the Royal Observatory, Edinburgh.

Rev. Walter Sidgreaves, S.J.

For Photographs of Stellar Spectra.

Albert Norman, L.R.C.P., L.R.C.S.

For Photomicrograph and Photographs of crystals and biological specimens.

J. E. Stead, F.R.S.

For Photomicrographs of iron, steel and other substances.

Dr. G. Lindsay Johnson, F.R.C.S.

For Photomicrographs.

Dr. E. J. Spitta.

For Illustrations of the application of photomicrography.

Dr. T. K. Rose, D.Sc.

For Photomicrographs of Silver-Cadmium alloys and steel.

A. J. Newton.

For Illustration of Photo-Engraving, Photo-Lithography, Chromo-Typography, etc.

The Geological Photographs Committee of the British Association.

For Photographs illustrative of the Application of Photography to the study of Geology.

B. H. Bentley, M.A., F.L.S.

For Photographic Studies in the Biology of Flowers.

The Survey of India Department.

For Specimens of heliogravure and the reproduction of maps by various processes.

The Cretan Exploration Fund.

For Photographs illustrative of recent discoveries in Crete.

Dr. W. E. Wilson, D.Sc., F.R.S.

For Stellar Photographs.

Professor W. N. Hartley, D.Sc., F.R.S.

For Photographs for Absorption Spectra, etc.

GROUP 17.

Cedric Chivers.

For Decorated Bookbindings, and special bindings for Public Libraries.

Kelly's Directories, Limited.

For Directories of London, of Great Britain and Ireland, and of certain British Colonies.

Augener & Company.

For Examples of printed Music and Music Books.

The Egypt Exploration Fund.

For Books published by the Society.

The Palestine Exploration Fund.

For Books published by the Society, illustrative of the history, geography and archaeology of Palestine.

The Royal Geographical Society.

For Books published by the Society.

GROUP 18.

Edward Stanford.

For Collection of Maps and other Geographical Publications.

W. & A. K. Johnston, Limited.

For Collection of Maps, Atlases, etc.

GROUP 19.

A. Hilger.

For Echelon Diffraction Grating and Auxiliary Apparatus.

W. F. Stanley & Company, Limited.

For Theodolites, and for Surveying and Mathematical Instruments.

Newton & Company.

For Optical Lantern and Induction Coil.

Thos. Thorp.

For Transparent Replicas of Rowland's Reflection Grating, Spectroscopes and Polarizing Solar eye Plate.

GROUP 21.

Boosey & Company.

Joseph Higham, Limited.

For Band Instruments.

GROUP 23.

Allen & Hanburys, Limited.

For Foods, Malted Preparations, Jujubes, Pastilles, etc.

Stafford Allen & Sons, Limited.

For Essential Oils, Expressed Oils, and Pharmaceutical Preparations.

The Anglo-Sicilian Sulphur Company, Limited.

For chemically produced Sulphur.

Baird & Tatlock, Limited.

For Chemical Laboratory Apparatus.

Brooke, Simpson & Spiller, Limited.

For Coal-Tar Products.

Brunner, Mond & Company, Limited.

For Ammonia-Soda Products and General Chemicals for Technical purposes.

The Burmah Oil Company, Limited.

For Crude-Petroleum, and Petroleum Products, including Candles, Wax & Oils.

The Cassel Gold Extracting Company, Limited.

For Cyanides.

The Castner-Kellner Alkali Company, Limited.

For Alkali Products obtained by Electrolytic Processes.

Chance & Hunt, Limited.

For Alkali Products.

Spencer Chapman & Messel, Limited.

For various preparations of sulphur.

Corbyn, Stacey & Company, Limited.

For Drugs and Pharmaceutical Preparations.

John J. Griffin & Sons, Limited.

For Laboratory Apparatus.

Hemingway & Company, and Hemingway's London Purple Company, Limited.

For Colours used in Manufactures, and for "London Purple" Insecticide, for destruction of leaf-eating insects.

Jeyes' Sanitary Compounds Company, Limited.

For "Cyllin" and other disinfectant Preparations, Soaps, etc.

McDougall Brothers.

For Non-Poisonous Sheep Dips and Disinfectants.

May and Baker, Limited.

For Pharmaceutical Preparations; Pure Chemical Salts; Cyanogen Products; Camphor; Special Technical Chemical Preparations.

Dr. Ludwig Mond, F.R.S.

For Model of Mond's patent gas-producer plant, with ammonia recovery apparatus.

T. Morson & Son.

For Pharmaceutical and fine Chemicals.

The Owens College.

For Collection of Chemical Compounds.

James Pain & Sons.

For Models of Fireworks, Ship Signals, Ammunition, Line-throwing and other rockets, etc.

Read Holliday & Sons, Limited.

For Coal Tar Compounds and Colour Derivatives.

The Royal College of Science.

For Specimens illustrative of Research Work by Staff and Students, arranged by Professor W. A. Tilden, D.Sc., F.R.S., President of the Chemical Society of London.

The South Metropolitan Gas Company.

For Specimens illustrative of the Evolution of Coal Gas Tar.

Townson & Mercer.

For Chemical and Scientific Apparatus.

Thomas Tyrer & Company, Limited.

For Pure fine Chemicals and Pharmaceutical Preparations.

The Wellcome Chemical Research Laboratories.

For Exhibit illustrating investigations conducted in the Laboratories.

John & Jas. White.

For Bichromates of Potash and Soda.

Wood and Bedford.

For Oxidised Oils (Brins-Bedford Process) and Products.

GROUP 26.

The Grand Junction Canal Company.

For Plans and Photographs of Barge Lift.

The Westminster City Council.

For Photographs of methods of municipal work and appliances and drawings of various formations of roads.

The London County Council.

For Model of Shield used during the construction of the tunnel under the Thames at Blackwall, London.

Stothert & Pitt, Limited.

For Outline Model of 50 tons block-setting Titan made for the construction of the Harbour of Refuge, Peterhead, in Scotland, and Photographs of Harbour-making Plant.

The Corporation of the City of Glasgow.

For Model of the Ruchill Fever Hospital, Glasgow, and
Plans and Photographs of the Ruchill Sanitary Wash-
house.

The County Councils of Middlesex and Surrey.

For Model of King Edward VII. Bridge over the River
Thames, connecting the Counties of Middlesex and
Surrey, at Kew, England.

The Manchester Corporation (Rivers Department).

For Plans showing arrangement of New Sewage Purification
Works on the Biological System at Manchester.

The London & South Western Railway Company.

For Model of the Southampton Docks and Harbour.

The Bombay Port Trust.

For Plans of Bombay Harbour and Docks.

GROUP 27.

Robinson Hainsworth.

For Working Models of Passenger Elevator and Mining
Cage.

DEPARTMENT OF MANUFACTURES.

GROUP 28.

P. and J. Arnold.

For Writing and Copying Inks.

GROUP 30.

John Wells.

For Historical Collection of English, Irish and Scotch
Silverware and Sheffield Plate.

GROUP 34.

F. P. Bhumgara & Company.

For Carved and Inlaid Sandalwood Boxes and other fancy
articles.

GROUP 37.

Ch. Mellier & Company.

For Decorative Woodwork for the Interior of Buildings.

GROUP 41.

Peter Wright & Sons.

For Solid Wrought Anvils and Wrought Iron Vices.

GROUP 42.

George Trollope & Sons.

For Paper Hanging.

GROUP 44.

F. P. Bhumgara & Company.

For East Indian Wall Coverings and Hangings.

Arthur H. Lee.

For Machine-woven Tapestry Hangings.

William Birch, Limited.

Ch. Mellier & Company.

George Trollope & Sons.

Waring & Gillow, Limited.

For Upholstery and Upholsterers' Decorations.

GROUP 45.

Booths, Limited.

For Samples of Dinner Ware in Semi-Porcelain and Silicon China bodies.

The Crown Staffordshire Porcelain Company.

For Crown Staffordshire Porcelain.

William Harry Grindley & Company.

For High-class Crockery Ware.

Johnson Bros. (Hanley), Limited.

For Royal Semi-Porcelain Ware.

John Maddock & Sons, Limited.

For Vitreous and Vitrified Porcelain Ware.

Alfred Meakin, Limited.

For Crockery in white granite, semi-porcelain, and decorated semi-porcelain. Also Section Panels of Decorated Tiles.

Minton, Hollins & Company.

For Fountain in Faience; Wall and Floor Decorations in Majolica; Mosaic and Tile.

Sherwin & Cotton.

For Glazed Tiles for Interior Decoration.

Henry Watkin.

For Watkin's Heat Recorder.

G. Woolliscroft & Son, Limited.

For Faience Gas-stoves, Tile Hearths and Fenders, Decorative Wall Tiling.

Sir Edmund Harry Elton, Bart.

For Elton Ware.

GROUP 46.

Waring & Gillow, Limited.

For Sanitary Fittings.

GROUP 47.

John Moncrieff.

For Model of Locomotive made of Perth Gauge Glass Tubes, and Pump for Testing Gauge Glasses.

The Cloisonné Mosaic Company.

For Cloisonné Glass Mosaic.

GROUP 50.

Wilson Bros. Bobbin Company, Limited.

For Bobbins, Shuttles, and Shuttle Fittings.

Wilson & Co., Barnsley, Limited.

For Bobbins.

GROUP 51.

The Singer Manufacturing Company.

For Sewing Machines for Textile Fabrics.

GROUP 52.

Danl. Lee & Company.

For Fabrics printed by Machinery and by hand blocks.

William Liddell & Company, Limited.

John S. Brown & Sons.

For Bleached Damasks and Linens.

GROUP 53.

The Singer Manufacturing Company.

For Sewing Machines for wearing apparel.

GROUP 54.

Turnbull & Stockdale, Limited.

For Velvets and Tissues.

Danl. Lee & Company.

For Cretonnes in Cotton and Cotton Velvets.

GROUP 55.

The Gourepore Company, Limited.

For Jute.

Danl. Lee & Company.

For Printed Cretonnes.

Steel & Company, Dunfermline, Limited.

For Damasks and Linens.

Turnbull & Stockdale, Limited.

For Printed Linens.

GROUP 58.

P. P. Borg & Company.

For Maltese Lace.

William Liddell & Company, Limited.

For Embroidered Linen.

John S. Brown & Sons.

For Embroidered Cloths.

The Convent of St. Louis, Carrickmacross.

For Carrickmacross Lace.

Convent of Mercy, Killarney.

For Irish Needlepoint Lace.

St. Joseph's Convent of Mercy.

For Limerick Lace and Irish Crochet Lace.

Mrs. Fowler.

For Honiton Pillow and Appliqué Lace.

The North Buckinghamshire Lace Association.

For Buckinghamshire Pillow Lace.

The School of Embroidery, Macclesfield.

For Specimens of Embroidery.

F. & R. Vigers and Mary Symonds.
For Ecclesiastical Embroidery.

GROUP 59.

Debenham and Freebody.
For Costumes trimmed with Lace.

Voila.
For Bridal dress of White Satin, with garniture, and of
Limerick Lace, and Embroidered Gowns.

GROUP 60.

The Singer Manufacturing Company.
For Fur Sewing Machines.

GROUP 61.

F. P. Bhumgara & Company.
For East Indian Goods as applied to Clothing.

DEPARTMENT OF ELECTRICITY.

GROUP 68.

The United Alkali Company, Limited.
• For Chemicals for Electrical Purposes.

GROUP 69.

The Consolidated Electrical Company, Limited.
For Circuit Breakers, Switch Boards, Switches, and other
apparatus for the distribution of electrical energy. Also
for Telephonic Apparatus.

George Trollope & Sons.
For Electric lighting applied to residences.

GROUP 70.

The India Rubber, Gutta Percha and Telegraph Works Com-
pany, Limited.

For Samples of Submarine and other Electric Cables.

Muirhead & Company.
For Thomson's (Lord Kelvin) Siphon Recorder, Galvano-
meters, and other Electrical Instruments.

GROUP 71.

Alfred C. Cossor.

For Glow Lamps, Vacuum Tubes, X-Ray Tubes, and other apparatus for electrical and medico-electrical work.

Crompton & Company, Limited.

Elliott Brothers.

Everett, Edgcumbe & Company.

For Instruments for Electrical Measurements.

Kelvin & James White, Limited.

For Electric Balances and Voltmeters.

Nalder Bros. & Thompson, Limited.

For Ammeters, Voltmeters and other electrical apparatus.

Robt. W. Paul.

For Resistance Coils, galvanometers, and other electrical apparatus.

The Synchronome Company.

For a system of Electrically-Propelled Dials, controlled by a Self-wound Pendulum.

Newton & Company.

For Induction Coils.

DEPARTMENT OF TRANSPORTATION.

GROUP 74.

The Public Works Department (Railways), India.

For Collection of Maps, Drawings and Photographs illustrative of the work of the Railway Branch of the Department of Public Works.

GROUP 75.

The Anchor Line (Henderson Brothers), Limited.

For Model of the twin-screw Steamship "Columbia."

The City of Dublin Steam Packet Company.

For Model of the four Twin-Screw Mail Steamers "Ulster," "Leinster," "Munster," "Connaught," and model of the S.S. "Kilkenny."

The Oceanic Steam Navigation Company, Limited (White Star Line).

For Model and Oil Painting of White Star R.M.S.
"Oceanic."

James Pain & Sons.

For Ships' Night Signals, Fog Signals, Life-Saving Apparatus, etc.

Swan Hunter & Wigham Richardson, Limited.

For Models of Steamers, Model of Bermuda Floating Dock and Photographs.

DEPARTMENT OF AGRICULTURE.

GROUP 80.

The Aberdeen Comb Works Company, Limited.

The Sheppy Glue & Chemical Works, Limited.
For Artificial Fertilisers.

GROUP 83.

The Board of Agricultural & Fisheries.

For Annual & Departmental Reports and other Publications.

The Royal Agricultural Society of England.

For Reports and Publications, Coloured Diagrams relating to the Life History of the Wheat Plant Insects injurious to Farm Crops and the Potato Disease.

GROUP 84.

The Joint Exhibitions Committee.

For Collection of Products from the Island of Jamaica.

The Government of the Gold Coast.

For Collection of Products from the Colony of the Gold Coast, West Africa.

GROUP 86.

A. Boake Roberts & Company, Limited.

For Chemicals for the Defecation of Sugar, etc.

F. Kendall & Son, Limited.

For Brewing Sugars and Chemicals for manufacturing chemicals.

GROUP 87.

Burroughs, Wellcome & Company.

For Extract of Malt, etc.

Allen & Hanburys, Limited.

For the "Allenbury's" Foods, and malted preparations.

GROUP 88.

McDougall Brothers.

For Baking Powder.

Joseph Edmunds.

For "Favourite" Baking Powder.

GROUP 90.

H. P. Setna & Company.

For Indian Condiments.

Evans, Sons, Lescher & Webb, Limited.

For Lime Fruit Juice, Essences, etc.

F. Kendall & Son, Limited.

For Tartaric and Citric Acids, Sugars.

GROUP 91.

The Belfast Mineral Water Company, Limited.

For Aerated and Mineral Waters, Lemonade and Ginger Ale.

GROUP 93.

A. Boake Roberts & Company, Limited.

For Essences and Essential Oils.

GROUP 95.

A. S. Mackertich & Company.

For Jute and Bengal Hemp.

GROUP 96.

McDougall Brothers.

For Chemicals for destroying Plant Diseases.

DEPARTMENT OF HORTICULTURE.

GROUP 105.

Dr. Henry.

For Photographs of Trees.

GROUP 107.

Joseph Edmunds.

For Exhibit of Bombay Mangoes and Vanilla Pods.

GROUP 108.

James Carter & Company.

For Flowers, Seeds, Gladiolis, Lilies, etc.

John Forbes.

For Collection of Phloxes, East Indian Stocks and other flowers.

Kelway & Son.

For Collection of Plants and annuals.

H. Cannell & Sons.

For Collection of Dahlias and Herbaceous Plants.

Sander & Sons.

For Collection of Tuberous Begonias.

GROUP 110.

Sutton & Sons.

For Grass seeds as shown in the Garden of the British Royal Pavilion.

DEPARTMENT OF FORESTRY.

GROUP 112.

The Forest Department of India.

For Publications, Maps, Photographs, working plans, etc., of the Forest Administration.

H. J. Elwes, F.R.S.

For Photographs of Forest Trees.

GROUP 114.

The Wellcome Chemical Research Laboratories.

For Preparations of Plants for Pharmacy and Manufacture.

DEPARTMENT OF MINES AND METALLURGY.

GROUP 115.

Robinson Hainsworth.

For Working model, Patent safety-catch, shown on model of Self-tipping Mining skip, model of Mining Cage (Men), and model of Passenger Elevator.

John Davis & Sons.

For Surveying Instruments and Lamps for Mines.

GROUP 116.

The Verde Antico Marble Company, Limited.

For Verde Antico Marble.

P. Macfadyen & Company.

For Indian Manganese Ores and Magnesite.

Johnson & Sons, Limited.

For Plant of Briquette Machinery.

The Harehope Mining and Quarrying Company, Limited.

For Polished and unpolished Marble.

The British South Africa Company (Rhodesia).

For Gold Quartz, Copper, Coal, Iron and other Minerals.
Plans, Diagrams and Publications.

GROUP 118.

Anglo-French Nickel Company, Limited.

For Specimens of Nickel and Cobalt Ores, etc.

Sherard Cowper-Coles & Company, Limited.

For Exhibit illustrating the process of Sherardising, the Centrifugal Copper Process, and Electro-Galvanizing.

The Lilleshall Company, Limited.

For Samples of Iron Ores and Limestone, and samples of Manufactured Iron.

The Sheepbridge Coal and Iron Company, Limited.

For Samples of Pig and Manufactured Iron.

GROUP 119.

The Institution of Mining Engineers.

For the Publications of the Institution.

DEPARTMENT OF FISH AND GAME.

GROUP 120.

Charles Lancaster.

For Sporting Guns and Rifles.

GROUP 121.

Major Alfred St. Hill Gibbons.

For Collection of Hunting Trophies.

GROUP 122.

The Marine Biological Association of the United Kingdom.

For the Publications of the Marine Biological Association.

GROUP 123.

Joseph Edmunds.

For Essence of Anchovies, Fish Pastes, etc.

Burroughs, Wellcome & Company.

For Antiseptics for preserving Fish.

SILVER MEDALS.

DEPARTMENT OF LIBERAL ARTS.

GROUP 15.

Gooden & Fox.

For Mezzotints and Photogravures.

L. H. Lefèvre & Son.

For Engravings, Etchings, etc.

GROUP 16.

Harold Baker.

Mrs. G. A. Barton.

David Blount.

W. Cadby.

Miss Constance Ellis.

John H. Gear, F.R.P.S.

Charles F. Grindrod.

The Right Honourable Viscount Maitland.

F. J. Mortimer.

J. C. S. Mummery.

Ralph W. Robinson.

Frank M. Sutcliffe.

W. Thomas.

T. Wright.

For Pictorial Photographs from Nature.

Dr. Tempest Anderson.

For Photographs of Volcanoes.

T. E. Freshwater, F.R.M.S.

For Photomicrographs of Geological Specimens and of
Insects.

Douglas English, B.A.

For Photographs of small Mammals, Butterflies, etc.

Captain D. Wilson-Barker.

For Photographs of Clouds.

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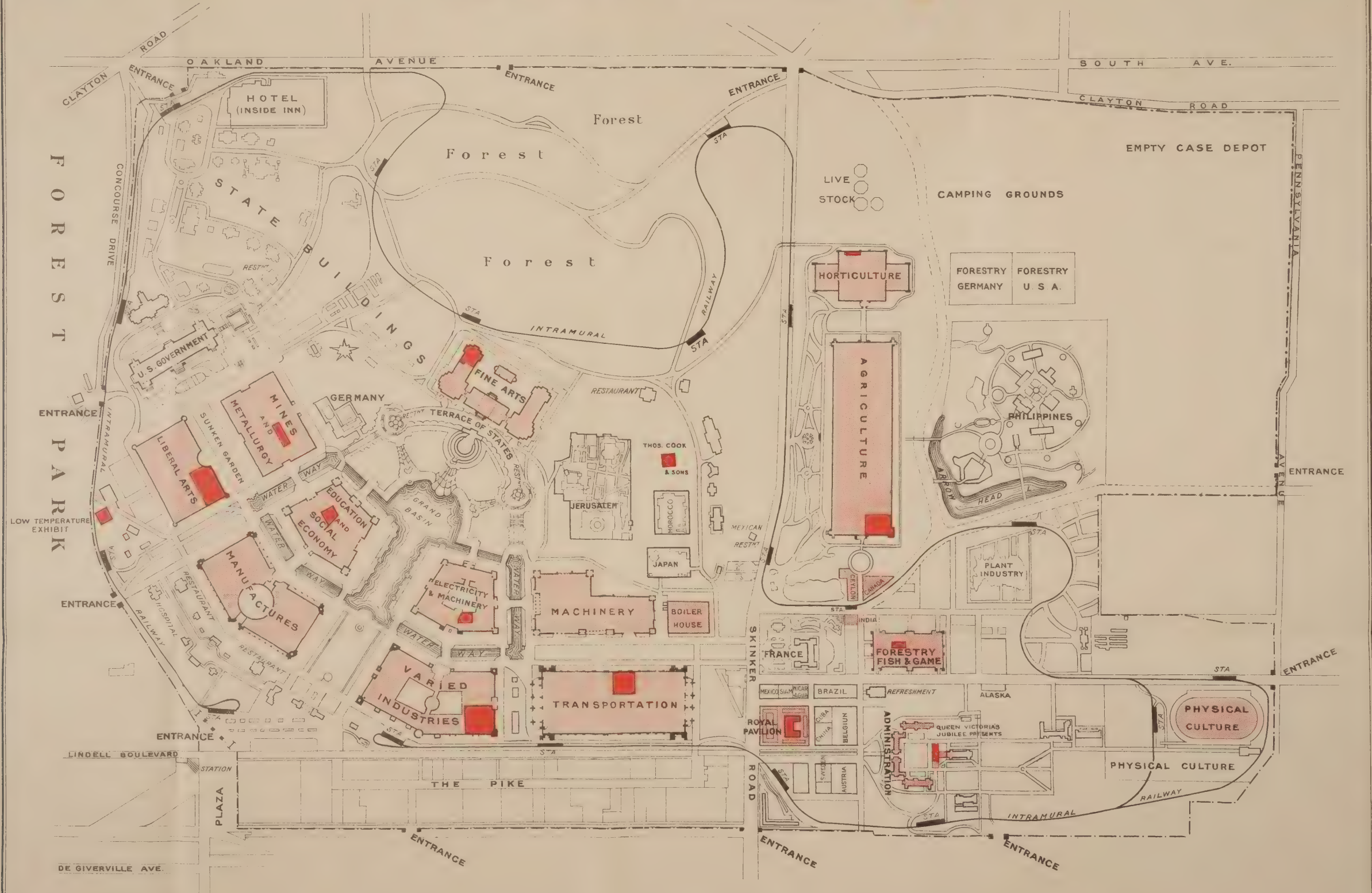
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